1991 OAHU SHORELINE MANAGEMENT PLAN

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Prepared For:

City and County of Honolulu
Department of Land Utilization

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EXECUTIVE SUMMARY

This report is a follow-up to and builds upon the data base established by Part 1. and Part 2., of the Oahu Shoreline Survey, by Sea Engineering, Inc., published in 1989. The objective of this report is to explore alternative strategies, both regulatory and non-regulatory, for preserving certain Oahu beaches threatened with loss through erosion, and to formulate a general and beach-specific plan for preserving these natural resources.

As discussed in Section 2., certain constraints have impeded beach preservation in the past, including lack of a good historical technical data base for predicting erosion, overlapping governmental jurisdictions, and funding restraints. An additional complexity, the primary focus of this report, is the

conflict between preserving a public resource and protecting private property interests in those areas where significant residential development has already occurred, or is likely to occur in the future.

Section 3. describes the basis and methodology for the analysis of 31 miles of Oahu's sandy beaches and the considerations given particular attention in developing beach preservation strategies. These considerations include:

1. The implications of regulatory changes on small, shallow, or otherwise severely-impacted lots.

2. The desirability of easing regulatory requirements in some areas to allow certain structures, such as small retaining walls and open work fences.

3. The advantages and disadvantages of permanent setback on both the private property owner, the general public, and public agencies charged with administration and enforcement of beach preservation.

4. The extent and effects of illegal seawalls on future beach preservation strategies.

An analysis of the State of Florida's comprehensive program for preserving its beaches is contained in Section 4., followed by a description of the history and relationships of Oahu's existing regulatory regime in this regard. The conclusion reached is that there is no lack of policies, programs, and regulations but more a lack of focus and funds directed specifically at preserving endangered beaches and resolving public/private interest in the shoreline.

Section 5. profiles 19 Oahu beaches where residential development has occurred, where beach loss has occurred as a result of natural forces and/or man-made development, and where previous studies recommended increased shoreline setbacks. In addition to detailed physical descriptions, the profiles include the more intangible but equally important cultural, historical and recreational features of these beaches.

Six alternative regulatory approaches to beach preservation are explored in Section 6. and traditional non-regulatory approaches, such as beach replenishment and re-vegetation are discussed in Section 7. The regulatory approaches range from retaining existing shoreline setbacks (40 feet in most instances) to increasing setbacks and prohibiting shoreline protection structures. The relative advantages and disadvantages of each approach are also discussed.

Section 8. contains the recommended strategies and rationale which would serve as a shoreline management plan, directly focusing on preventing future beach loss. General recommendations are for both short-term and long-term actions, including:

1. Eliminating the 20-foot shoreline setback now permitted in certain cases.

2. Requiring a minimum 3,000 square feet buildable lot area for residential beachfront properties.

3. Prohibiting shoreline setback "credit" on accreted shorefront land.

4. Increasing setbacks to 60 feet for new developments or redevelopments at increased densities.

5. "Grandfathering" illegal shoreline protection structures when they can meet established engineering and design standards.

6. Prohibiting vertical seawall structures in certain areas.

7. Strengthening criteria for shoreline setback variances.

8. Imposing civil fines for violations within the shoreline setback area.

9. Establishing a Beach Preservation (overlay) District, and adopting a form of Improvement District for vulnerable beach sectors.

10. Establishing and funding a recruitment and training program for a professional monitoring and enforcement staff to implement the management plan.

In addition to these general recommendations, and because of the diverse characteristics of Oahu's beaches, specific strategies tailored to each of the profiled beaches are also recommended.

1991 OAHU SHORELINE MANAGEMENT PLAN

1. BACKGROUND

The *Oahu Shoreline Study*, Part 1. and Part 2., conducted by Sea Engineering, Inc., and published in November and December of 1989, documented and evaluated changes on 59 miles of Oahu's sandy shoreline.

Study results showed that, over the past 40 years, accretion has occurred on approximately one-third of our beaches, erosion has occurred on more than one-third, and one-third are more or less stable. The objective was to develop preliminary preservation strategies by integrating the beach change data from Part 1. with existing land uses, the shoreline condition, the recreational value of the shoreline, the ongoing beach processes, and the oceanographic conditions and hazards of the particular area.

The *Oahu Shoreline Study* recommended that shoreline setbacks be increased along approximately 31 of 59 miles of Oahu's shoreline. Of this, 16 miles were developed with residential uses and the remaining 15 miles were either undeveloped, or in industrial or park use.

A Bill for an Ordinance (Bill No. 7-90) was subsequently proposed by the City Administration and introduced on January 9, 1990. It proposed, for an interim period, increased setbacks within the Oahu study area. In many areas, existing 40-foot setbacks along residentially-developed areas would have been increased to 60 feet. The rationale for the proposed interim increases was contained in Part 1. and Part 2. of the shoreline study referenced above. Bill No. 7-90 was filed, without further action, on April 4, 1990. Testimony in opposition to the Bill focused primarily on the loss of the use of privately-owned property to the proposed increased setbacks.

2. STATEMENT OF PROBLEM/DISCUSSION OF PUBLIC ISSUES AND CONCERNS

As noted above, the *Oahu Shoreline Study* covered 59 miles of Oahu's sandy shoreline. Major areas not covered included Kaneohe Bay, Ala Moana and Waikiki, beaches under military control, Kualoa and several other beach parks, the area between Kahuku Point and Kahuku Golf Course, and Kahe Beach. Of the 59 miles of beaches studied, approximately 22 miles, or 37 percent of the total, have eroded over the past 40 years.

Many of the beaches of Oahu, which have a high public value as a natural resource, and are limited in extent, are being destroyed through erosion. Some of the loss is from natural causes, such as waves, wind, and severe storms, but much of it is associated with man-made developments.

According to *The Cost of Environmental Protection: Regulating Housing Development in the Coastal Zone*:

> "Typically, residential developments constitute the primary competitor for coastal resources and dominate the land use pattern within the coastal zone. The pressures of population and economic development threaten to overwhelm the balanced and best use of the invaluable and irreplaceable coastal resources."

Beach preservation is an explicit, acknowledged goal of Federal, State, and City land use policies and regulations, but beach erosion continues to occur and the loss of a highly-valued, but severely-limited public resource proceeds. There is no lack of governmental shoreline protection, management and enhancement policy documents, guidelines, and regulations, but successful preservation strategies, which translate into actual beach preservation action, have lagged behind.

Hawaii, like every coastal state, recognizes beaches as one of our most valuable resources. They represent a substantial economic base, both as a major attraction for the visitor industry and as highly-valued homesites. They provide scenic and recreational benefits to visitor and resident alike, offering a wide range of opportunities for popular leisure activities and a welcome diversion from and contrast to the more urban and intensively-developed areas of Oahu. They are also a rich source of historical legend and cultural significance.

The erosion of Hawaii's beaches, and Oahu's in particular, has been well-documented, first in *Beach Changes on Oahu as Revealed by Aerial Photographs*, Dennis Hwang, 1981; in the *Oahu Shoreline Study*, Parts 1. and 2.,

Sea Engineering, Inc., 1989; and in *Hawaii Shoreline Erosion Management Study*, Edward K. Noda and Associates, Inc., and OHM, Inc., 1989.

The loss of our beaches is caused by both natural forces and man-made developments. Most studies in this state, and in others, conclude that a combination of regulatory and non-regulatory strategies are needed to counter both.

Studies in this state suggest, however, some severe constraints on both regulatory and non-regulatory strategies which, in the past, have prevented a progressive beach preservation effort. They are summarized as follows:

1. Lack of a good historical technical data base for measuring past erosion and predicting future erosion loss, and a shortage of personnel (coastal engineering) expertise.

2. Overlapping jurisdictions and complex regulations,which make for a lack of coordination and effective action among various levels of government.

3. Funding restraints, particularly at the county level of government, which adversely affect a beach preservation program in several respects, including a lack of adequate staffing in maintaining a data base and in monitoring and enforcing existing regulations. These restraints not only affect existing efforts, but may preclude more ambitious non-regulatory strategies, such as beach replenishment, and new regulatory approaches, such as "special districts" for beach preservation.

4. The complex question of "public good versus private interest." Of the 59 miles of beaches surveyed in the *Oahu Shoreline Study*, 58 percent are already developed with residential uses. Clearly, areas which are undeveloped, developed in public park use, or planned for major resort or marine-oriented industrial uses are relatively easier to control through existing governmental review and the regulatory regime. Areas where there are a number of private homeowners create special problems and conflicts. For example, when erosion occurs, the most likely and frequent response from a homeowner is to erect a shoreline protection structure, usually a seawall or revetment. This can cause adverse impacts on neighboring shoreline properties (sometimes producing a chain-reaction and the proliferation of protection structures) and can, in the long-term, lead to irreversible erosion and loss of public beaches.

The continuing concern about an adequate data base is not unique to Hawaii and seems to be shared by all coastal states attempting to preserve their beach resources. Florida, which most references agree has the most sophisticated

data base and the most progressive beach preservation system in place, is still trying to improve its information base. The local studies referenced earlier have contributed to the state's data on erosion of beaches, and information on Oahu beaches is certainly more abundant and accurate than it has ever been in the past. Maintaining and continuing to enhance what we have in the way of data should be a major priority, of course, but should not preclude the development of action-oriented beach preservation strategies. Lack of adequate technical data should no longer be cited as a reason for postponing remedial action.

Funding and staffing a monitoring and enforcement program is a continuing concern as well. If non-regulatory strategies, such as beach replenishment, are pursued, even more of a public monetary investment will be needed. The *Hawaii Shoreline Erosion Management Study* recommended consideration of "improvement districts" for beaches where preservation objectives are endangered. The Improvement District is a traditional, tested, and usually successful concept which involves public/private funding, assessing a fair share of the improvement monies required to those who benefit most from the improvements. It is also a time-consuming, controversial process. Again, the lack of funds committed to beach preservation is a serious concern, but other, more easily accomplished strategies should be immediately evaluated and implemented.

While all of the above constraints exist and the concern about them is valid to some degree, the focus of this report is primarily on #4. above, those areas where the preservation of a public resource comes into direct conflict with individual private property interests. Both regulatory and non-regulatory strategies will be addressed, and the advantages and disadvantages of each will be evaluated.

3. PURPOSE, APPROACH, AND METHODOLOGY

This report focuses on 31 miles of Oahu's sandy beaches which meet all of the following criteria:

a. Are developed primarily in residential use;

b. Are high-quality recreational beaches which should be preserved for public use;

c. Were recommended in Part 2. of the *Oahu Shoreline Study*, for increased shoreline setbacks. Figure 3.1. is a map of these areas.

The specific objectives of the study are:

a. To reconfirm and clearly identify natural beach sectors which are high-quality public recreational resources;

b. To develop alternative strategies and a management plan for preservation of these beaches;

c. To examine the impacts of these alternative strategies on existing residences and other uses of private lands abutting the shoreline; and

d. To recommend government regulations and other actions to carry out a plan encompassing the most promising strategies.

As a basis for the analysis which follows, Sea Engineering, Inc., prepared digitized maps showing all major structures, seawalls, revetments, and the beach toe and vegetation line as of 1988 for the 13 miles of residential shoreline properties included in the study area.

Aerial photos (1988), vertical and oblique, were used for the location of these structures. Field visits were required to validate results. The City Department of Land Utilization's (DLU) seawall inventory was also used to identify the prevalence of shoreline protection structures and their legal status.

It should be noted that the above information was used to build upon the basic methodology of Part 1. and Part 2. of the *Oahu Shoreline Study*, which utilized historical beach transect data in the development of a statistical model. For this model, updated transect tables were used to predict future shoreline positions and to provide information on the statistical variability of the prediction. Development of the model, which also serves as the technical basis for this report, is described in detail in Part 2. of the Oahu Shoreline Study, along with the results.

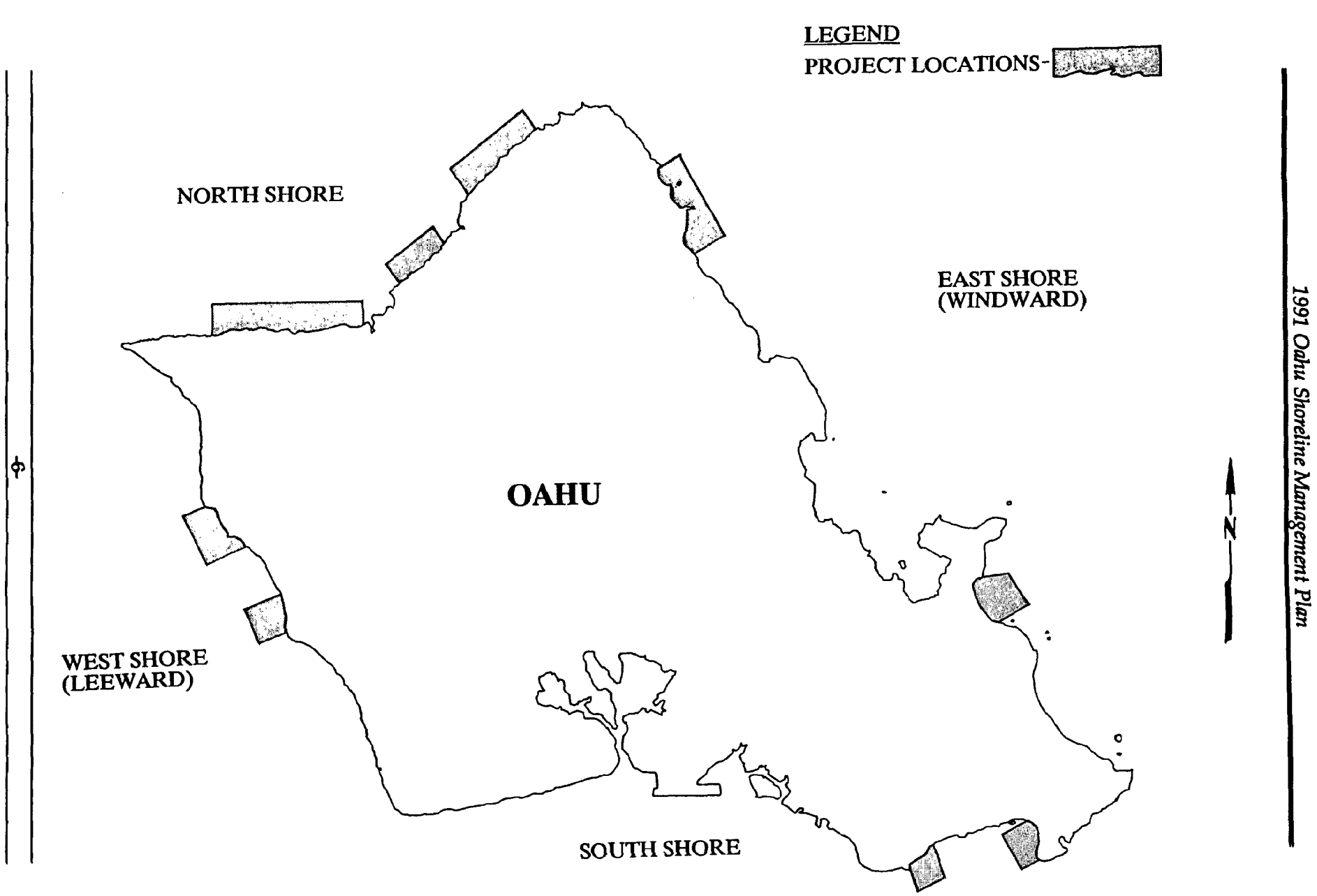


FIGURE 3-1. - AREA MAP

In identifying and analyzing alternative preservation strategies, the following considerations were given particular attention:

a. The implications of regulatory changes on small, shallow, or otherwise severely-impacted lots.

b. The desirability of easing regulatory requirements in some areas to allow certain structures, such as small retaining walls and open work fences.

c. The advantages and disadvantages of permanent setbacks on both the private property owner, the general public, and public agencies charged with administration and enforcement of beach preservation.

d. The extent and effects of illegal seawalls on future beach preservation strategies.

It should be noted that the regulatory strategies evaluated ranged from a "status quo" posture, which would retain the existing 40-foot universal setback, to a prohibition of all shoreline protection structures. In addition, a realistic and effective monitoring and enforcement program was considered an integral part of each preservation strategy, and non-regulatory erosion control/beach preservation techniques were considered as an essential supplement to regulatory strategies.

4. GENERAL BEACH PRESERVATION STRATEGIES:

4.1 State of Florida Beach and Shore Preservation Act

The State of Florida has had a strong and comprehensive program for preservation of its beaches in place since 1970 (the Beach and Shore Preservation Act, enacted by the Florida Legislature). The regulatory agency for this program is the State Department of Natural Resources, Division of Beaches and Shores.

Like Hawaii, the state's beaches contribute significantly to the economy as an attraction for tourists, and the Legislature explicitly acknowledged in the Beach and Shore Preservation Act (Chapter 161, Florida Statutes) that "beach and shore erosion is a serious menace to the economy and general welfare of the people of this state."

The beach preservation effort in Florida has four major elements, as described in *Florida's Beach and Coast Preservation Program: An Overview*, by James H. Balsillie. These elements are the establishment of a sound scientific and engineering basis through Coastal Construction Control Lines, coupled with a Thirty-Year Erosion Projection Program, a Permitting and Enforcement component, and a Beach Erosion Control Program.

The Coastal Construction Control Lines (CCCL) are setback or control lines established on a county-by-county basis (but only in sandy-beach counties) and designed to address the erosive forces of "extreme event impacts," such as heavy storms and hurricanes. The control lines are developed on the basis of field data collection and storm tide and dune erosion modeling. In cases where property owners refute the Division's findings, a public hearing is held.

It should be noted that one of the most important aspects of the Florida beach preservation program is the emphasis on data collection and establishment of the scientific and engineering basis for the CCCL. According to Balsillie's overview, referenced above, more than 9,800 beach profiles and more than 2,300 offshore profiles are stored in the computerized data base. This data, combined with aerial photographs, are then plotted on photomaps.

To supplement this extensive data base, modeling is used to determine storm tide water levels and wave heights for periods of 10, 50, 100, 200 and 500 years. Dune/bluff erosion as a result of storm impact is also modeled. Results are used in determining the location of CCCLs.

It should be noted that **restudy** of the established CCCLs may be initiated and that the control lines may be altered when documented shoreline changes

render established lines ineffective. This is an important element of flexibility which makes this aspect of the preservation program responsive to changing physical conditions.

In addition to the control of erosion caused by "extreme event impacts," long-term shoreline change trends are taken into account. The Thirty-Year Erosion Projection Program essentially prohibits major structures which would be placed seaward of the "seasonal high-water line" within 30 years of the permit request. This prohibited area is based on projections of erosion in the area. Exemptions are provided for shoreline protection structures and other "minor" structures.

As noted previously, a credible regulatory program (permitting, monitoring, and enforcing) is essential to any serious beach preservation effort. Florida's permitting program is distinguished by its emphasis on technically-oriented coastal design and engineering considerations.

The applicant is required to submit technical data such as a recent topographical survey and detailed, site-specific grading, drainage and structural plans. Permits are reviewed by a coastal engineering staff which consider storm surge data, design wind velocity/structural loading computations, federal base flood elevation requirements, and other factors related to the predicted natural forces in the area and design life of the proposed structure.

Beach-dune preservation and project siting are also considered, e.g. construction impacts on the beach and adjacent property and potential cumulative impacts along the shore, and public access.

Permit and violation monitoring is accomplished not only by a staff of field inspectors, but is supplemented by periodic site visits by the coastal engineering staff. Violators are prosecuted and fined, for each offense, an amount up to $10,000. Each day a violation occurs is considered a separate offense.

Finally, perhaps the most interesting component of Florida's beach preservation program is a recognition that simply regulating public/private interests in this arena, essentially perceived as a negative effort, is not enough.

Under the Beach Erosion Control Program, an existing agency is designated the "beach and shore preservation authority" and administers a Beach Management Trust Fund. This fund is used to carry out long-range plans for erosion control and beach preservation and is specifically earmarked to assist local governments in alleviating sandy beach erosion when it occurs and preserving sandy beach resources.

According to Balsillie's overview, specific projects include:

"a. Beach restoration/renourishment,

b. Sand transfer, bypassing and stockpiling,

c. Jetties, groins, breakwaters, revetments,

d. Sand trap construction and maintenance,

e. Dune construction and revegetation,

f. Beach-dune overwalks,

g. Dune protective walkways or other measures for dune protection/preservation,

h. Sand fencing,

i. Biological and hydrological monitoring studies,

j. Sand source studies,

k. Education signs, and

l. Other projects of desirable intent."

These projects can only be done within pre-established boundaries, "Erosion Control Lines," to ensure an equitable distribution of a restored beach between State and upland ownership and to guarantee public use of beach resources seaward of the Erosion Control Line. In addition, the applicant for a project must provide permanent public access to the area and adequate vehicle parking areas.

It should be noted that the preservation programs described above work in concert toward a single and focused objective, preservation of sandy beaches, and that they are soundly based in legislative intent by the Florida Legislature's statement: "The greater public interest compels that certain reasonable restrictions be placed upon the location of coastal construction and excavation even though such construction or excavation be located on privately-held land."

4.2 Oahu: History and Relationships of Existing Preservation Mechanisms

Beach preservation is not the exclusive objective of existing Federal, State, and City policies and regulatory controls on Oahu, but it is explicitly addressed in all.

At the Federal level, The Coastal Zone Management Act of 1972 created a mechanism for assisting coastal states in managing resources within their

coastal zones. (Other Federal involvement in this area includes the flood insurance programs of the Federal Emergency Management Agency, implemented through Flood Hazard District regulations at the City level, and the numerous activities of the U.S. Army Corps of Engineers.)

The Act specifies certain critical areas of concern, those which have the potential of being resource-depleted, where projected demands exceed available resources, or where resources are already limited and unique. With specific regard to Oahu's residentially-zoned and/or developed beaches, these critical areas apply:

"a. Areas of unique, fragile or vulnerable natural habitat;

b. Areas of high natural productivity or essential habitat;

c. Areas of substantial recreational value;

d. Areas where activities are dependent upon coastal waters;

e. Areas of unique geologic or topographic significance to industrial or commercial development;

f. Areas of urban concentration;

g. Areas of significant hazard, if developed; and

h. Areas needed to protect, maintain or replenish coastal lands or resources."

At the State level, Chapters 205 and 205A, Hawaii Revised Statutes (HRS), provide the basic, state-wide legislative framework for beach preservation. Again, the policy objectives are far broader, but they explicitly include beach preservation.

Chapter 205, HRS, established conservation districts for, among other things, "providing park lands, wilderness and beach." Until recently, the State Department of Land and Natural Resources (DLNR) had complete jurisdiction for all land seaward of the certified shoreline. State Act 356, 1989, permits the counties to expand their jurisdictional control into the "area between mean sea level and the shoreline." This is a significant move toward clarifying jurisdictional matters and is indicative of a trend toward directing monitoring and enforcement responsibilities toward the counties. (Refer to Section 6.6.)

Chapter 205A, HRS, was Hawaii's response to the federal Coastal Zone Management Act, and remains the basis for guiding, in terms of policy, and regulating the use of our coastal resources. Again, the objectives are broad, but preserving our major coastal resource, the beachfront, is explicitly expressed.

Reference 205-A-2: "Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites and sandy beaches, when such resources will be unavoidably damaged by development; ...

Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value."

City involvement on Oahu in the preservation of beaches involves two basic regulatory mechanisms: review and permitting of development proposals within the Special Management Area (SMA), a boundary which varies by area and extends inland beyond the actual established shoreline, and through the 40-foot shoreline setbacks established under Chapter 205A, HRS, Part III. Within this setback area, certain actions are specifically prohibited; however, a variance procedure is in place, which allows certain exceptions after City review. (It should be noted that while the common established shoreline setback is 40 feet, the law does provide for even lesser setbacks — to 20 feet — under certain "hardship" situations, e.g. for small, shallow lots.)

Both the Special Management Area statute and the Shoreline Setback Rules and Regulations address beach preservation as a public goal.

Reference, Section 205A-21, HRS: "The legislature finds that, special controls on developments within an area along the shoreline are necessary to avoid permanent losses of valuable resources and the foreclosure of management options, and to ensure that adequate access, by dedication or other means, to public owned or used beaches, recreation areas, and natural reserves is provided."

Reference Section 205A-26, HRS: "Alterations to existing land forms and vegetation, except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of earthquake." (Note: the statute also provides for "adequate access ... to publicly owned or used beaches.")

Reference, "Shoreline Setback Rules and Regulations of the City and County of Honolulu", Rule 2. Purpose: "Growing population and expanding development have brought about numerous cases of encroachment of structures upon the shore. Many of these structures have disturbed the natural processes and

caused erosion of the shore. Concrete masses along the shore are contrary to the policy for the preservation of the natural shore and open space. ... "Moreover, the Hawaiian Islands are subject to tsunamis and high waves which endanger residential dwellings and other structures which are built too close to the shoreline. For these reasons, it is in the public interest to establish shoreline setbacks and to regulate the use and activities within the shoreline setbacks."

Despite the comprehensive policies, programs, and specific regulatory controls available to public agencies on Oahu, at all three levels of government, there are certain limitations and constraints which ultimately affect beach preservation:

1. As noted above, while the commonly established shoreline setback is 40 feet, the statute does provide for setbacks of half that amount. In addition, all counties were given the option of increasing shoreline setbacks beyond 40 feet; none have done so, although Oahu has attempted to do so.

2. The Special Management Area (SMA) has, in many cases, proved itself as a valuable regulatory tool in preserving coastal resources, most notably when applied to large resort, commercial, or mixed-use developments on or near the shoreline. In these cases, additional shoreline setbacks and guarantees of public access to beaches have been imposed as a condition for SMA permit approval. However, single-family dwellings are exempt from the process. The basic and widespread conflict between the use of a beachfront parcel by private homeowners and preserving the beach as a public resource is not addressed by SMA controls.

3. While the shoreline setback variance procedure is a necessary approach to dealing equitably with "hardship" situations, it does intrinsically weaken the concept of preserving beaches. A potentially more serious impact is the number of illegal shoreline protection structures erected by individual beachfront owners in the past, the extent of which was not known until recently, when an inventory was completed by the City. Refusing to grant shoreline setback variances, or requiring the removal of every illegal seawall or other structure, would be the most straight-forward corrective action, but is not considered practical given the number of residentially-developed beachfront properties on Oahu.

As noted above and in other Sections of this study, there are certain positive improvements being made in beach preservation. For example:

(a) Establishing the nonconformity or illegality of existing protective structures was an important addition to the data base;

(b) Updating and increasing technical data on residentially-developed beach sectors by Sea Engineering, Inc., and mapping these areas has also significantly improved the information available to decision-makers;

(c) Streamlining and clarifying jurisdictional responsibilities between State and City should also contribute to more effective beach preservation strategies in the future, provided this leads to cooperative regulatory actions and necessary funding.

In summary, the problem is not a lack of legal controls, but rather the broad-based nature of the policies and programs, and the absence of regulatory and non-regulatory strategies specifically focused on — and funded for — the preservation of beaches undergoing erosion and threatened by either existing or future residential development.

5. PHYSICAL INVENTORY: OAHU BEACH SECTOR PROFILES

In this Section, selected Oahu beach sectors where residential development has occurred are profiled. It should be noted that these do not include all residentially-developed shoreline properties, but only those where increased setbacks were recommended in the *Oahu Shoreline Study*, Part 2. In certain cases, reference should be made to the *Oahu Shoreline Study* for a transect view of the beach sector, e.g. "Kawailoa #1."

The physical descriptions of the beach sectors are taken from the base data and model developed during the *Oahu Shoreline Study* and the additional data since gathered, described in Section 2., (now reflected in Figures 5.1 through 5.21).

More intangible, but equally important cultural, historical and recreational features of these beaches were drawn directly, in a highly condensed form, from the observations and legends presented by John R. K. Clark in *Beaches of Hawaii.*

5.1 Waialua District

5.1.A. Mokuleia

Mokuleia means "district of abundance," probably referring to an ancient time when it supported several large Hawaiian settlements. Modern-day recreational activities typically include diving, shorecasting, swimming, and beachcombing. Much of the Mokuleia beach area, with the exception of Mokuleia Beach Park, is private property where public access is limited. Inshore waters are considered relatively safe, but there is exposure to strong currents during winter months, especially when there is large surf activity along the North Shore.

The Mokuleia Beach residential area is approximately 2.5 miles long, and extends from the west end of Crozier Drive to Kaiaka Bay. Although the sandy beach is continuous, the conditions vary along the beach.

The shoreline is a continuous sandy beach, which consists of a number of gently curving, poorly defined embayments. Shoreline conditions vary greatly along the 2.5 mile sector with eroding areas, accreting areas and some protected areas.

The entire Mokuleia residential area is shown on Figures 5-1, 5-2 and 5-3. Figure 5-1 shows the western 4,000 feet of the sector. The area just west of

LEGEND:

——— On shore features (lots, buildings, roads)

——— Vegetation line as of February 1988

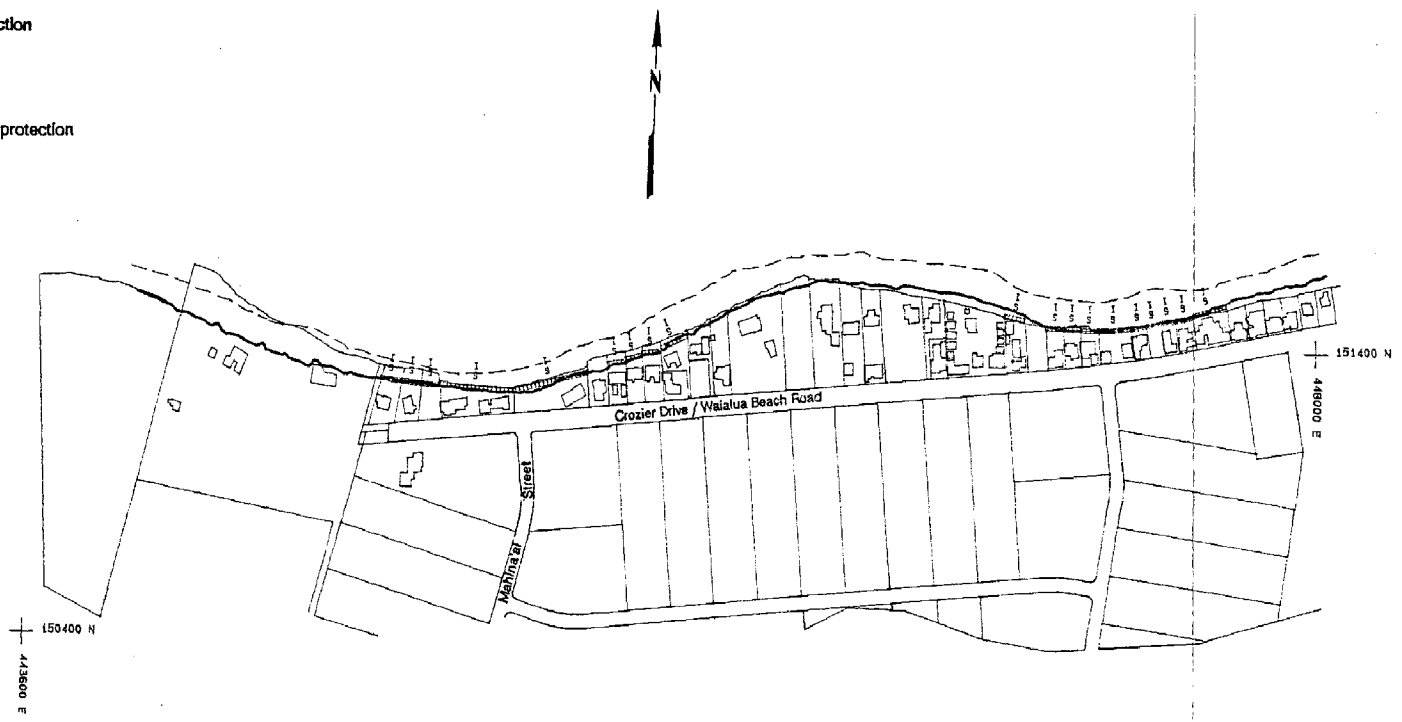
– – – Beach toe as of February 1988

▨ Shore Protection

S, R, O: Type of shore protection
- S = Seawalls
- R = Revetments
- O = Other

L, I, N: Legal status of shore protection
- L = Legal
- I = Illegal
- N = Nonconforming

1"=400' 400 0 400 800 scale feet



NOTE:

Lot lines and roads shown on this map are taken from the City and County of Honolulu Graphical Information System (GIS). Structure locations, vegetation lines and beach toe locations are based upon computer analysis of the City's set of February 1988 aerial photographs.

Seawalls and revetment locations are based upon the 1988 aerial photographs, with field verification in August and September 1990.

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FIGURE 5-1
MOKULEIA
(1 of 3)

LEGEND:

——— On shore features (lots, buildings, roads)
——— Vegetation line as of February 1988
– – – Beach toe as of February 1988
▨ Shore Protection

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1"=400' 400 0 400 800
scale feet

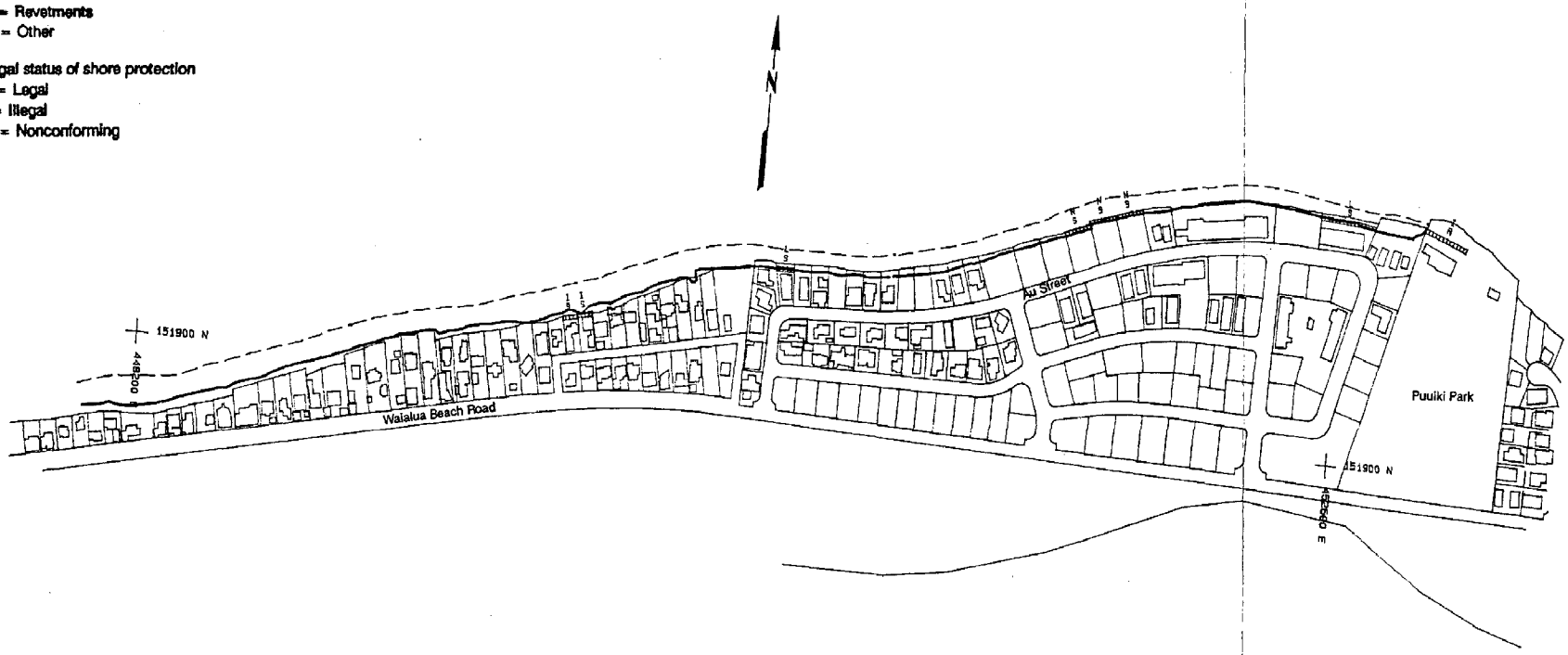

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FIGURE 5-2
MOKULEIA
(2 of 3)

LEGEND:

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– – – – Beach toe as of February 1988

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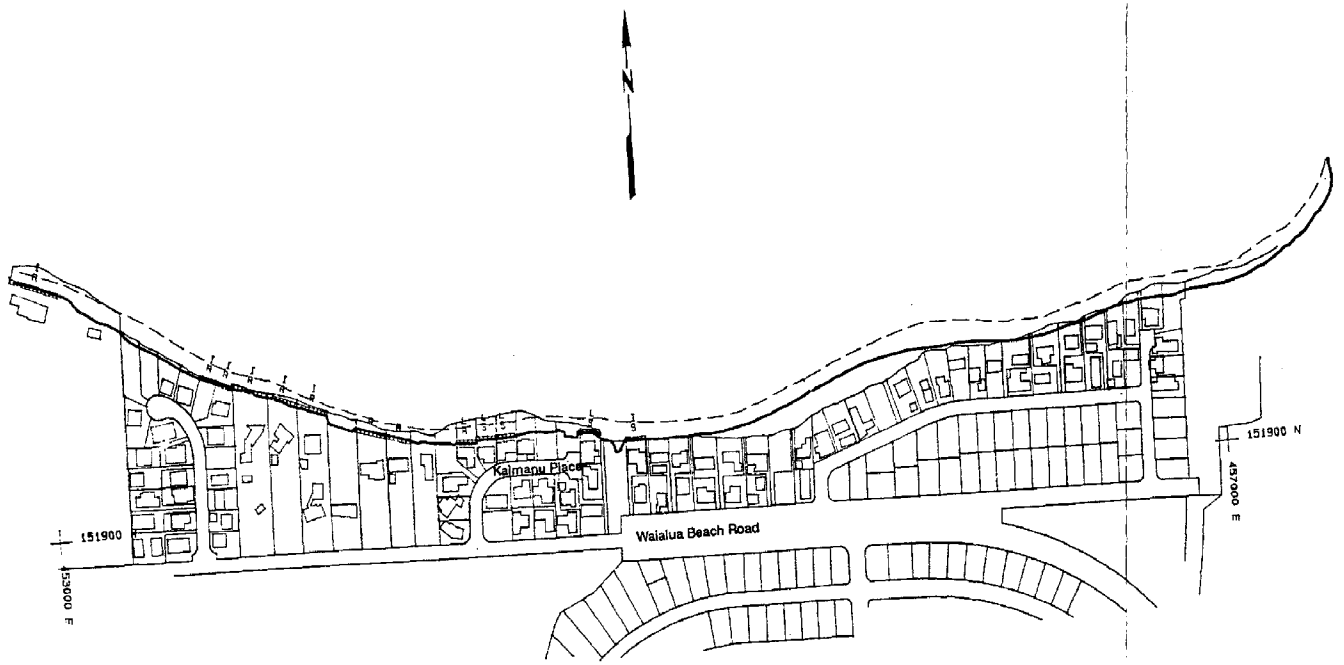

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FIGURE 5-3
MOKULEIA
(3 of 3)

Crozier Drive consists of two houses and three vacant lots. One house is set back approximately 40 feet from the vegetation line, but the other is very close to the line. Should any erosion occur, the house will be threatened.

The remaining 3,300 feet of the shoreline is fully developed, with many of the houses very close to the vegetation line and on small lots. Much of the vegetation line along this area has been stabilized by vertical retaining walls, and the extent of the walls is shown on Figure 5-1. The walls are concentrated in two areas. Although some of the walls are concrete, most are built of vertical timber planks or piles. In many locations, the walls are deteriorating and are in marginal condition.

These wooden retaining walls are similar to many others along the North Shore. The walls are more similar in design to retaining walls than to seawalls, since their main function appears to be stabilization of the vegetation line. Where the walls are present, the beach is generally narrower and steeper than in adjacent areas, and the general impression is that the beach is eroding. If the walls were not present, it appears that the beach slope would flatten out, possibly undercutting some of the houses close to the vegetation line.

The central, unprotected area of shoreline has a noticeably wider beach, with the houses set back from the vegetation line. There are no shore protection structures in this central area. Transect data from the 1988 *Oahu Shoreline Study* indicate that this shoreline accreted approximately 20 feet between 1979 and 1988. This gain should be considered temporary, and encroachment on the accreted area should be prevented.

Figure 5-2 shows the central 5,000 feet of Mokuleia Beach, down to Au street. The western 2,900 feet of this sector has a relatively wide beach and appears stable. The *Oahu Shoreline Study* indicated that accretion has occurred in this area, which would explain the deep setback of some of the houses. Since the accretion cycle could reverse at any time, encroachment on the accreted land should be prevented.

The beach condition deteriorates noticeably in the vicinity of Au Street. The beach narrows, and erosion is obviously occurring in many areas. Shore protection in place includes a temporary sandbag revetment, vertical seawalls, and sloping rock revetments. Lateral access is restricted in some places because of these revetments. Backshore development includes single-family houses, apartments and a proposed park site.

Figure 5-3 shows the east end of Mokuleia Beach, from Puuiki Park to the end of the residential development. The west end of this sector, from Puuiki Park to Kaimanu Place is eroding, and much of the shoreline is protected by seawalls and revetments. The eastern most 2,800 feet of Mokuleia Beach is accreting beach, with measured accretion over the past 40 years ranging from

31 to 87 feet. The existing houses are older and as a result are set well back from the vegetation line.

5.1.B. Kawailoa

Kawailoa, or "the long water," refers to a stream in the area which was thought to be the longest stream on Oahu. Kawailoa Beach encompasses many of the famous surfing areas on Oahu's North Shore. It changes with the seasons and experiences up to 40 feet of erosion in some sections during winter months.

Papailoa and Laniakea Beaches (Figure 5-4)

Papailoa ("long hut") refers to a temporary shack erected near a fishing ground and is the first section of Kawailoa Beach offering a place for swimming. Modern-day recreational activities at this beach include diving, shorecasting, board surfing, and swimming. Laniakea takes its name from a small freshwater spring, on the Waimea side of the point. It is a popular surfing beach, but not a particularly good swimming beach, because of strong currents.

The Papailoa and Laniakea 3,800-foot-long sandy shoreline appears to be a discrete littoral cell, bounded on the west end by a protruding beachrock point, and on the east end by a basalt peninsula. The transect data from the *Oahu Shoreline Study* indicate a generally stable or slightly eroding beach.

The backshore is zoned R-5 Residential District and, except where the highway is adjacent to the shore at Laniakea, it is fully developed. Exposed beachrock stabilizes the beach toe along the westernmost 1,000-foot-long developed sector of Papailoa Beach. The two houses at the point have stabilized the vegetation line by construction of a vertical timber retaining wall. The beach narrows and is noticeably steeper in the central section of Papailoa Beach. The houses are also slightly closer to the vegetation line. The two lots just west of the stream discharge may be subject to some erosion, particularly during summer months, when the predominant sand transport is apparently to the west.

These beaches are among the high quality North Shore beaches, but they are extensively developed. If erosion were to occur, some of the houses along the beach, particularly in the center and the east end, will be threatened.

Chun's Reef (Figure 5-5)

Chun's Reef, named for John Chun, a long-time resident, was once known by various Hawaiian names, many of which referred to the wind in the area. Chun's Reef is now a highly popular surfing spot.

LEGEND:

——— On shore features (lots, buildings, roads)

——— Vegetation line as of February 1988

– – – Beach toe as of February 1988

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1"=400' 400 0 400 800 scale feet

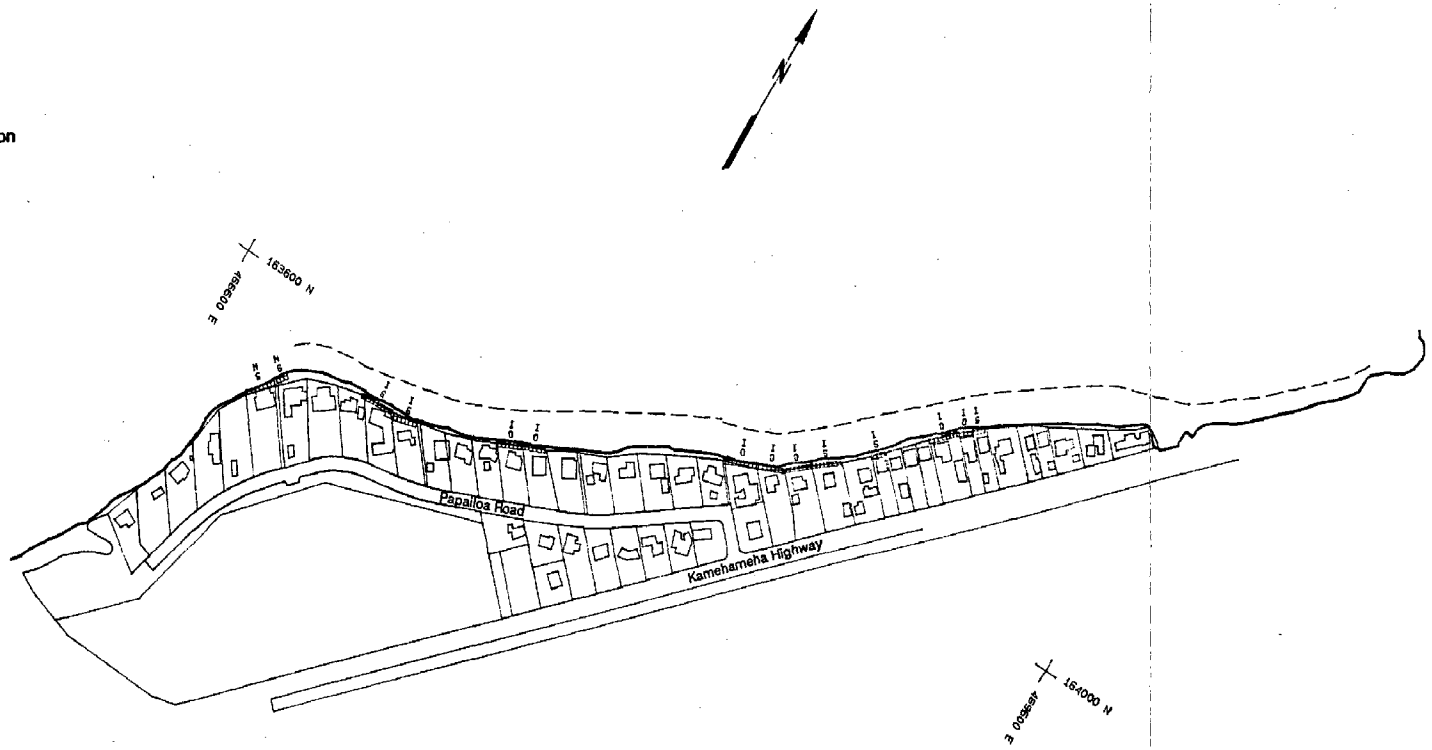

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FIGURE 5-4
PAPAILOA AND
LANIAKEA

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400 0 400 800
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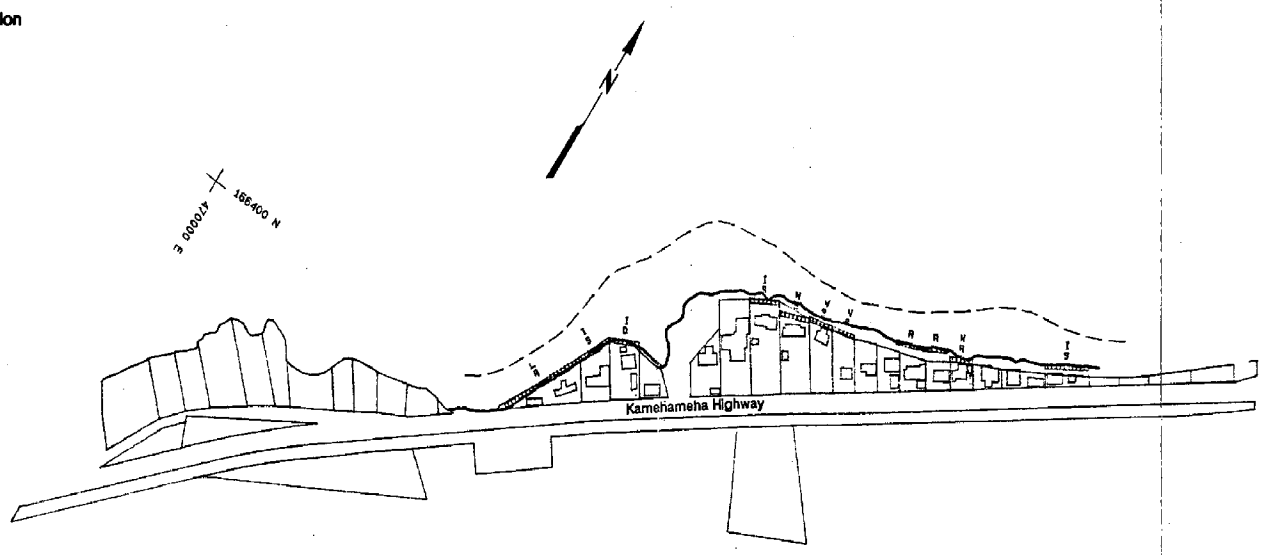

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FIGURE 5-5
CHUN'S REEF AND
KAWAILOA #1

This sector is bounded on the west by the highway and on the east by a storm water discharge path. The transect history indicates a stable beach, for the most part; however, there is a potential erosion problem at Kamehameha Highway access points both for Chun's Reef and Lanikea Beach.

The four house lots in the Chun's Reef area have some type of basalt boulder shore protection. The beach in front of the shore protection is very wide and gently sloping. Vegetation has grown seaward of the revetment in some places. (It appears that the rocks were placed to protect against the occasional event of waves undercutting the shoreline scarp). This is a high-quality, heavily-used recreational beach.

Kawailoa #1 (Figure 5-5)

East of the stream mouth separating the Chun's Reef residential area from the Kawailoa Beach, there is a 1,200-foot-long stretch of beach bounded by the stream mouth on the west and a basalt outcrop at the end toe of the beach on the east. Four contiguous lots in this area have a retaining wall stabilizing the vegetation line, with a total wall length of 400 feet. The beach is wide, with scattered basalt boulders along the shoreline. There is vegetation, including some fairly large ironwood trees, seaward of the retaining walls.

5.2 Koolauloa District

5.2.A. Sunset

Known to the surfing community as Sunset Beach, it was once called "Paumalu," which, based on a Hawaiian legend, means "taken by surprise." The Sunset area has spectacular surfing waves and has been the site of professional surfing contests known around the world. While diving and swimming are other recreational activities enjoyed in this beach area, board surfing is the predominant recreational activity.

Sunset Beach (Figures 5-6 and 5-7)

This beach sector is 11,000 feet long, and extends from Pupukea Beach Park to Sunset Point. Single-family dwellings extend along most of the backshore, with some interspersed park areas, including Ehukai and Sunset Beach Parks.

Sunset Beach is a high-quality, heavily-utilized North Shore beach with numerous access points to the beach.

The beach is wide during the summer, but is severely cut back during the winter wave season. The vegetation line has a small scarp in some parts of this sector, indicative of some wave undercutting during the winter. The tran-

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400 0 400 800

1"=400' scale feet

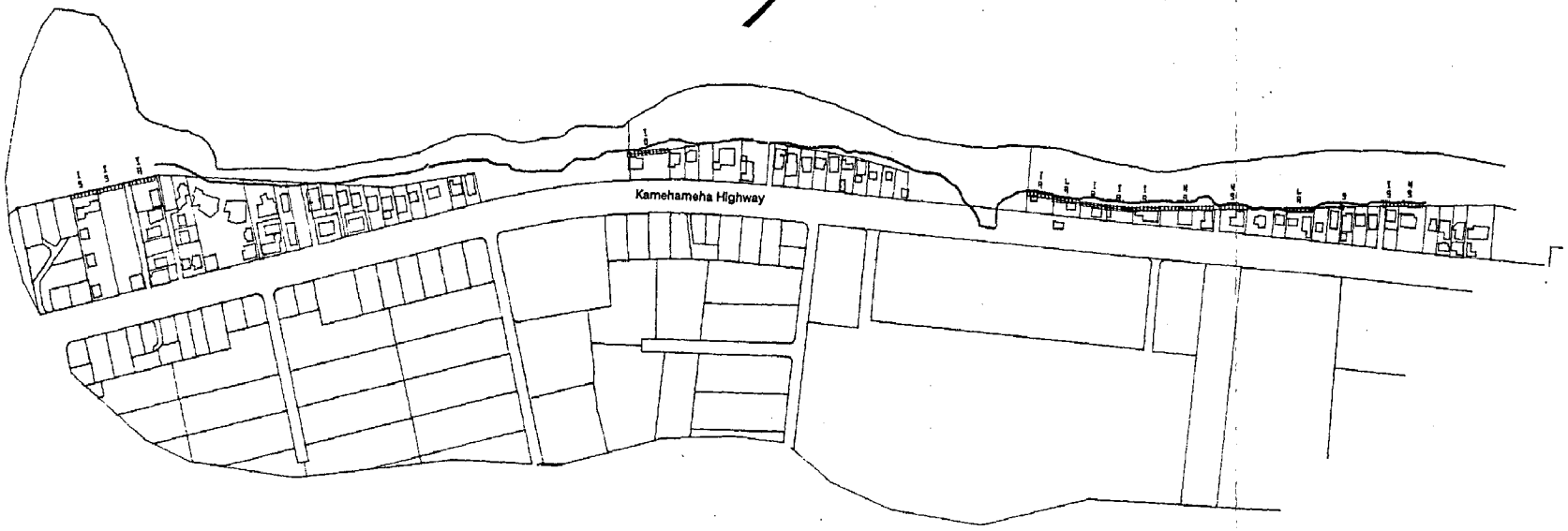

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FIGURE 5-6
SUNSET BEACH
(1 of 3)

LEGEND:

——— On shore features (lots, buildings, roads)

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– – – Beach toe as of February 1988

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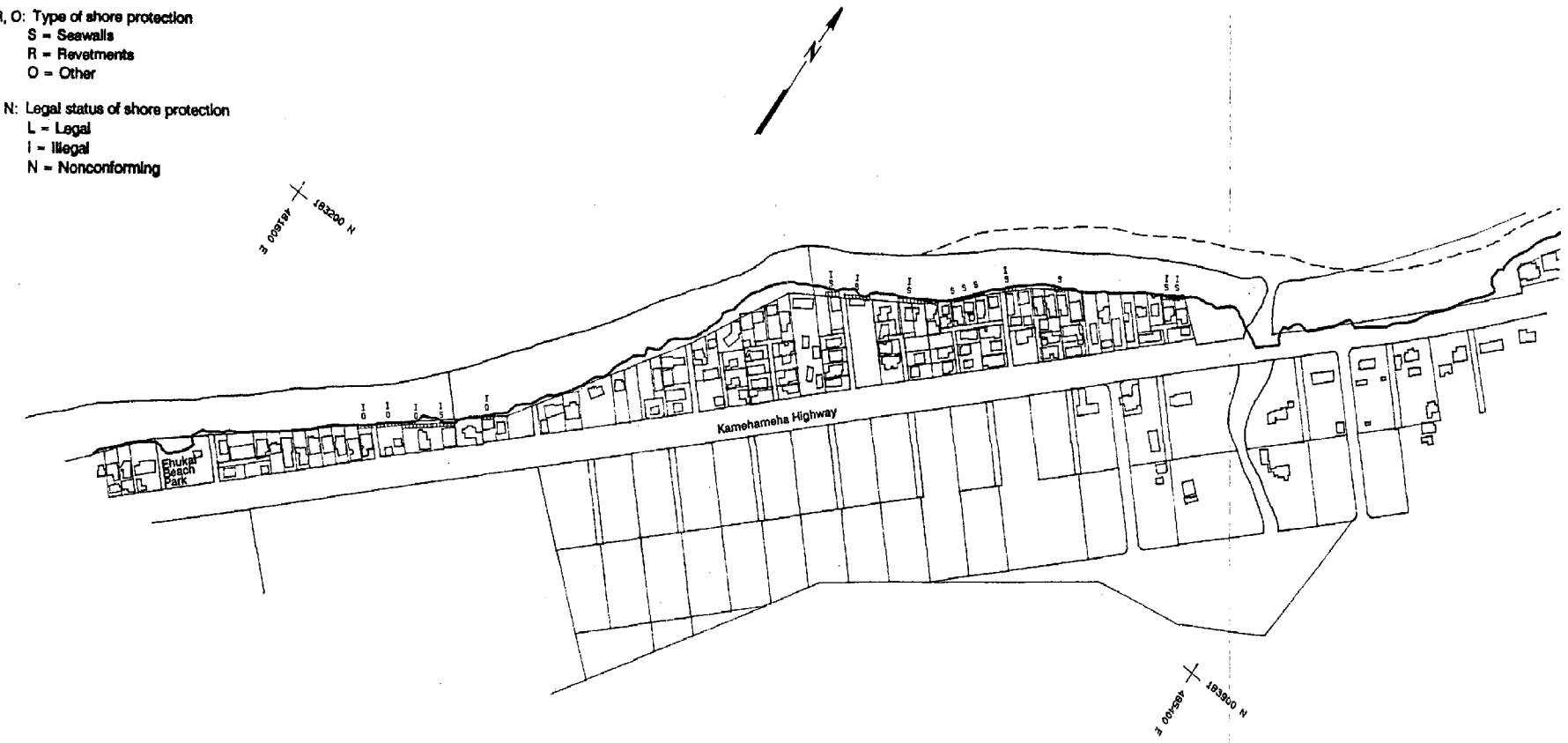

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FIGURE 5-7
SUNSET BEACH
(2 of 3)

sect data indicate a relatively stable beach, except during the high winter surf of December 1960. The transect located at Sunset Beach Park recorded significant erosion during the past 10 years.

One 1,350-foot-long sector of beach, just east of Pakulena Stream, has 950 feet protected by seawalls or rock revetments. Many of the houses along the beach have constructed small retaining walls and beach fences at the beach crest, apparently to prevent undercutting of the vegetation line during periods of high surf. Many of the houses along the beach are close to the vegetation line, and are subject to flooding during periods of very high winter surf.

Sunset Point (Figure 5-8)

According to *The Beaches of O'ahu,* "Sunset Point, the housing area and shoreline on the Kahuku side of the surfing beach, is better protected by a wide, fringing reef, but even there the inshore currents are strong when the waves are big."

This shoreline sector is 800 feet long and is completely lined with shore protection. Vertical seawalls are the most common type, but one large lot is protected by randomly dumped basalt boulders.

The 1988 aerial photographs show the seawall alignment at the point protruding further seaward than the vegetation line of the adjacent properties, an indication of ongoing erosion on each side of the point.

5.2.B. Waialee

"Waialee means 'rippling or stirring water.' At one time, on calm days when the tide was low, people on shore could see freshwater bubbling up in small fountains above the offshore reef. This upwelling of freshwater in the ocean may have influenced Hawaiians in naming the area." (Source: *The Beaches of O'ahu*) Recreational activities typically include diving, pole fishing, and swimming.

Kaunala Beach (Figure 5-8)

Kaunala is "the plaiting," or "the weaving," but the reason for this name is unknown. It is now often referred to as "Velzyland," originating with a surfing movie made on location. The area attracts beachcombers and fishermen in addition to surfers. Velzyland remains a famous surfing beach on Oahu's North Shore.

The shoreline area seaward of Makanale Street has been recently developed, and most of the lots shown on Figure 5-8 now either have houses or are in the permit stage. The next 1,600 feet of shoreline to the east, down to Kaunala

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400 0 400 800

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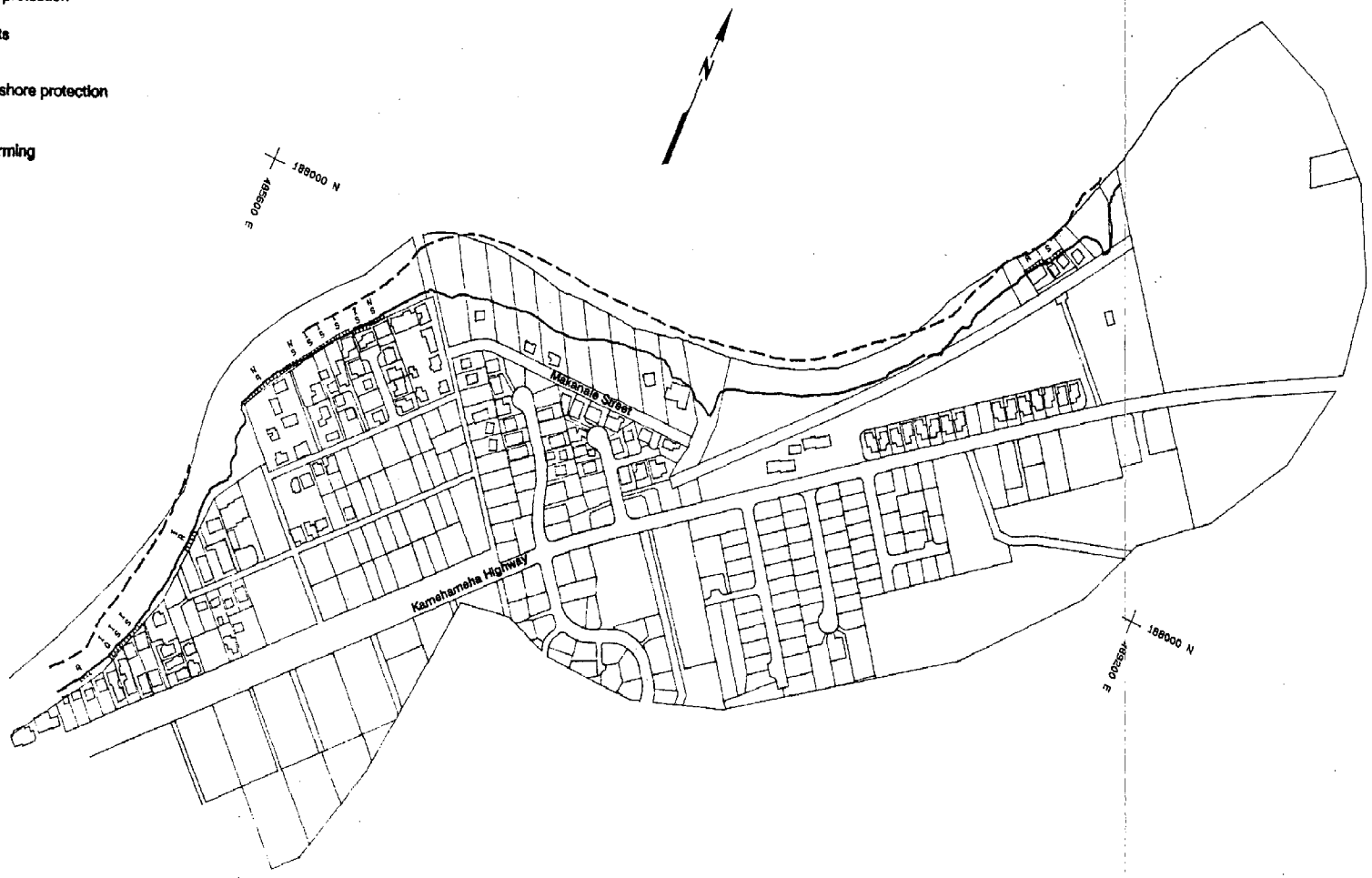

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FIGURE 5-8
SUNSET, SUNSET POINT AND KAUNALA (3 of 3)

Gulch Stream, is undeveloped except for four houses next to the stream discharge. The houses are either on, or close to, the vegetation line. Two of the four have built combination shore protection/retaining wall structures. The beach just west of the houses appears to be eroding with a slight scarp at the vegetation line and ironwood trees seaward of the present vegetation line.

Pahipahialua Beach (Figure 5-9)

Pahipahialua, "to clap the lands twice," is said to have been the name of a fishing shrine, but its exact location is lost. The beach is also known as West Kawela, and is occupied by a number of private beach homes.

This 2,700-foot-long beach is a discrete littoral cell, bounded by Kukaimanini Islet on the west and a limestone headland on the east. The area is zoned R-5, and much of it is developed with single-family dwellings.

At the west end, there is a 600-foot-long undeveloped property. The lot depth varies from 150 feet on the west end to only 60 feet on the east end.

Proceeding east from the point, there is a 1,000-foot long combination revetment/retaining wall, consisting of randomly dumped boulders. Several houses are protected by the wall, as are three or four vacant lots. The beach is narrow through this sector, and there are extensive beachrock outcrops at the toe of the beach. The beachrock is so extensive that the effect is to make the remaining beach a perched beach, above the normal tidal range.

The remaining 1,100-foot length of beach, extending to the limestone shelf at the point, has no shore protection structures, although one house in the middle of this sector is very close to the vegetation line. Again, beachrock is exposed at the water line along most of this sector, and probably provides some stability against erosion.

5.2.C. Malaekahana (Figure 5-10)

The naming of Malaekahana is also said to be connected with an ancient Hawaiian legend. The general area is well-known to fishermen and the inshore waters provide a safe swimming area. The area has long been the site of beach homes for the affluent.

Malaekahana Beach lies between Makahoa Point, a rocky headland, and Kahawainui Stream, and is approximately 8,500 feet long. The sector includes Kalanai Point, an unstable sandy tombolo in the lee of Mokuauia Island (Goat Island).

Figure 5-10 shows the northern 4,500 feet of this sector, which is zoned R-5 and is fully developed with single-family dwellings. Most of the houses are set

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400 0 400 800 feet

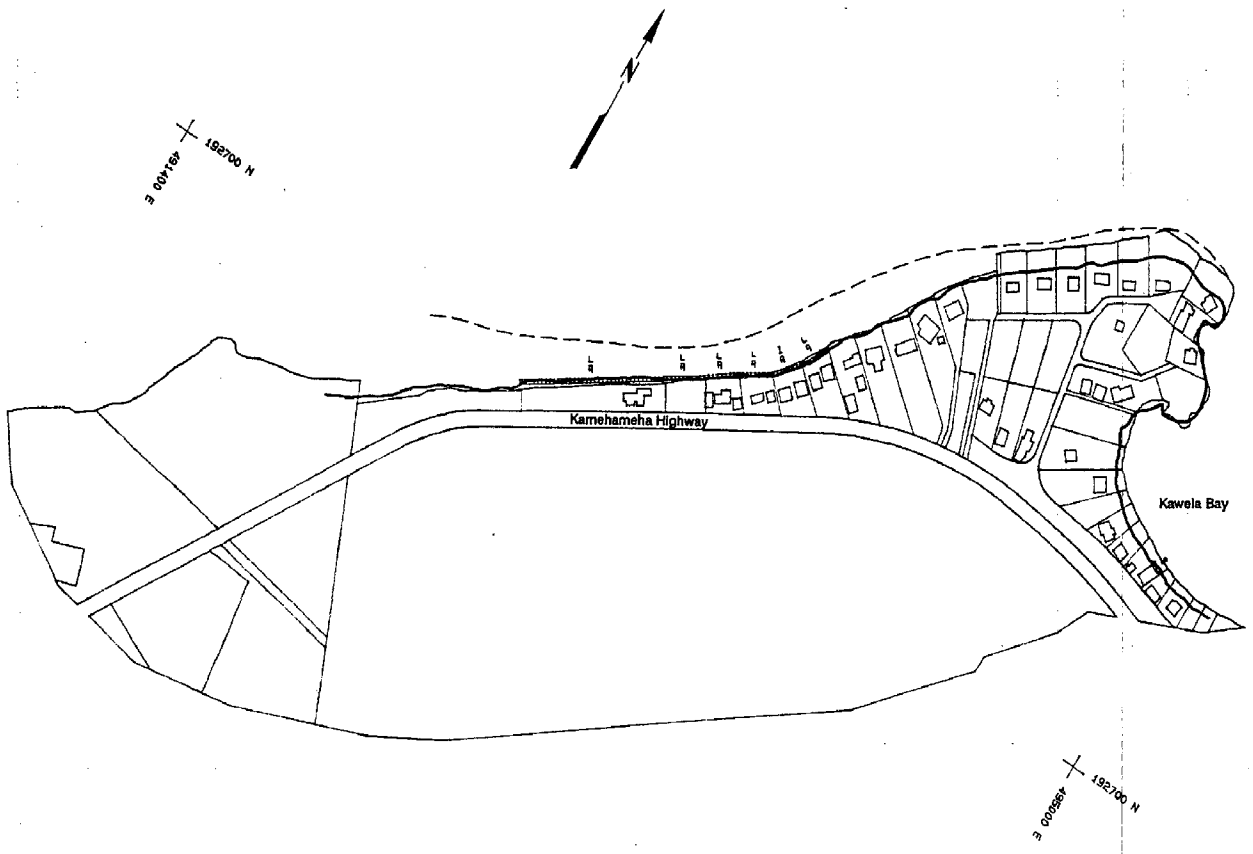

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FIGURE 5-9
PAHIPAHIALUA

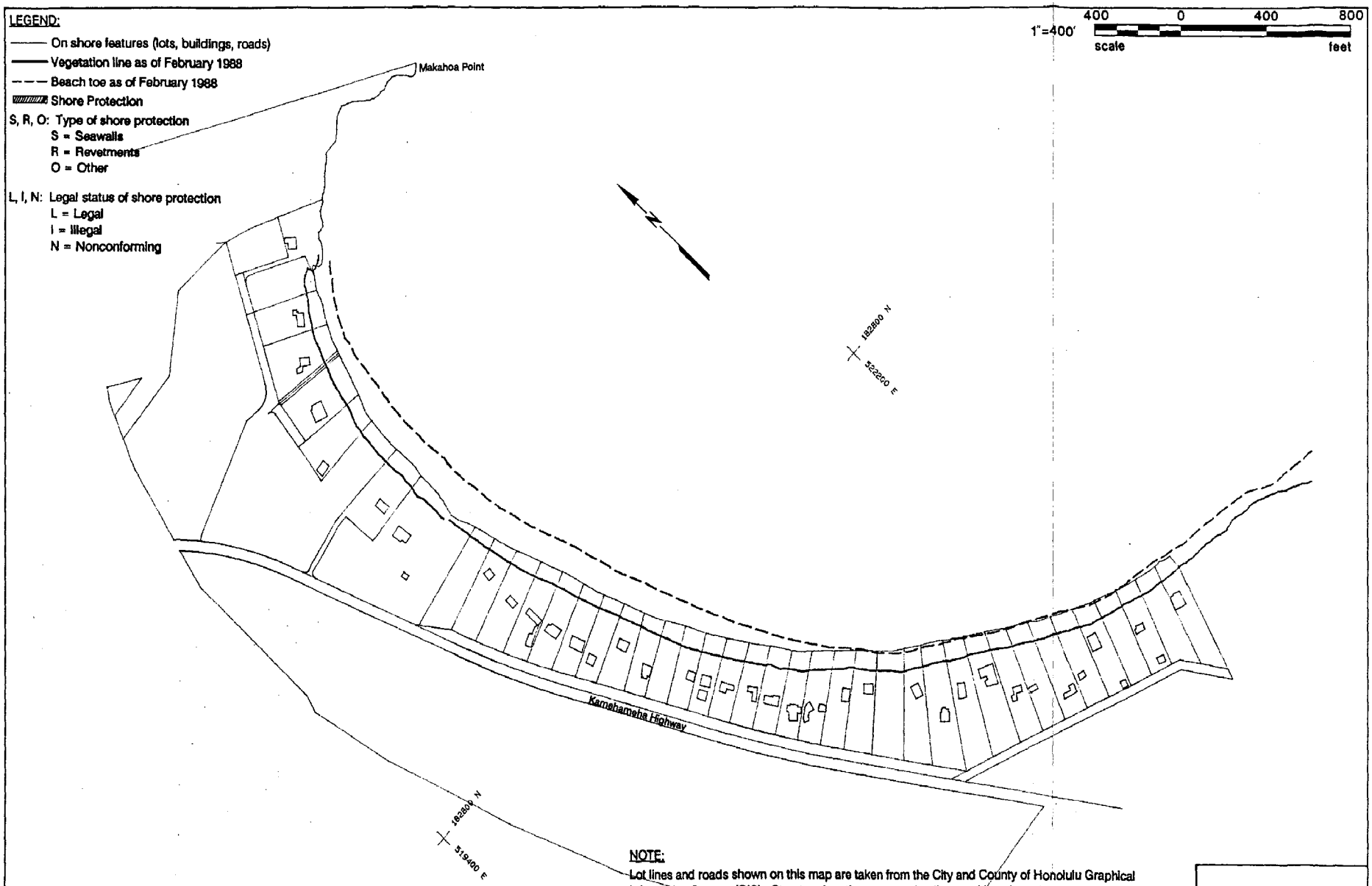

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FIGURE 5-10
MALAEKAHANA

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well back from the vegetation line and have relatively deep lots. A fairly high bluff extends along the beach, just inland of the vegetation line. Transect data indicate a stable or accreting beach. The main part of Malaekahana State Park is located to the east of the residential area.

5.2.D. Laie Beach (Figure 5-11)

According to *The Beaches of O'ahu*, "the land division of Laie was named for a beautiful legendary princess, Laieikawai, who was said to have been raised in the district." Recreational activities include diving, board surfing, bodysurfing, swimming, and throw-netting.

Laie Beach is a continuation of Malaekahana Beach, and is bounded on the north by Malaekahana State Park and on the south by Laie Point, a prominent headland. The 1,200-foot length just south of Kahawainui Stream is undeveloped, and is zoned preservation. The remaining 2,300 feet of this sector is zoned R-5 and is fully developed.

Depending on the location, the developed portion of Laie Beach has accreted from 15 to 48 feet over the past 40 years. Because of this accretion, the lots are relatively deep, particularly at the south end of the beach. There are very few shore protection structures along this beach.

5.2.E. Laniloa Beach (Laniloa #1 - Figure 5-12)

"Laniloa Beach takes its name from Laniloa Point, a wide, elevated protrusion of coraline rock thrusting into the sea." (Source: *The Beaches of O'ahu*) The beach provides a recreational activity area for diving, snorkeling, swimming and throw-netting.

Laniloa Beach is approximately one mile long and is bounded by Laie Point and Kehukuuna Point. The area is zoned R-5 and is almost completely developed with single-family dwellings. The sandy beach continues another 1,200 feet to the south, to Pali Kilo Ia, a distinct rocky headland. This beach sector is known as Pounders Beach and is a City park. Pounders Beach is separated from Laniloa Beach by the Koloa Stream discharge.

Laniloa #1 extends from Laie Point to a man-made groin 3,000 feet south of the point. Most of the sector has been developed with single-family dwellings, but there are a few open lots. The beach is relatively stable, but there are a few lots with shore protection on the south half of this sector. The predominant sand transport is to the south and the groin therefore stabilizes the southern part of this beach. South of the groin severe erosion has occurred.

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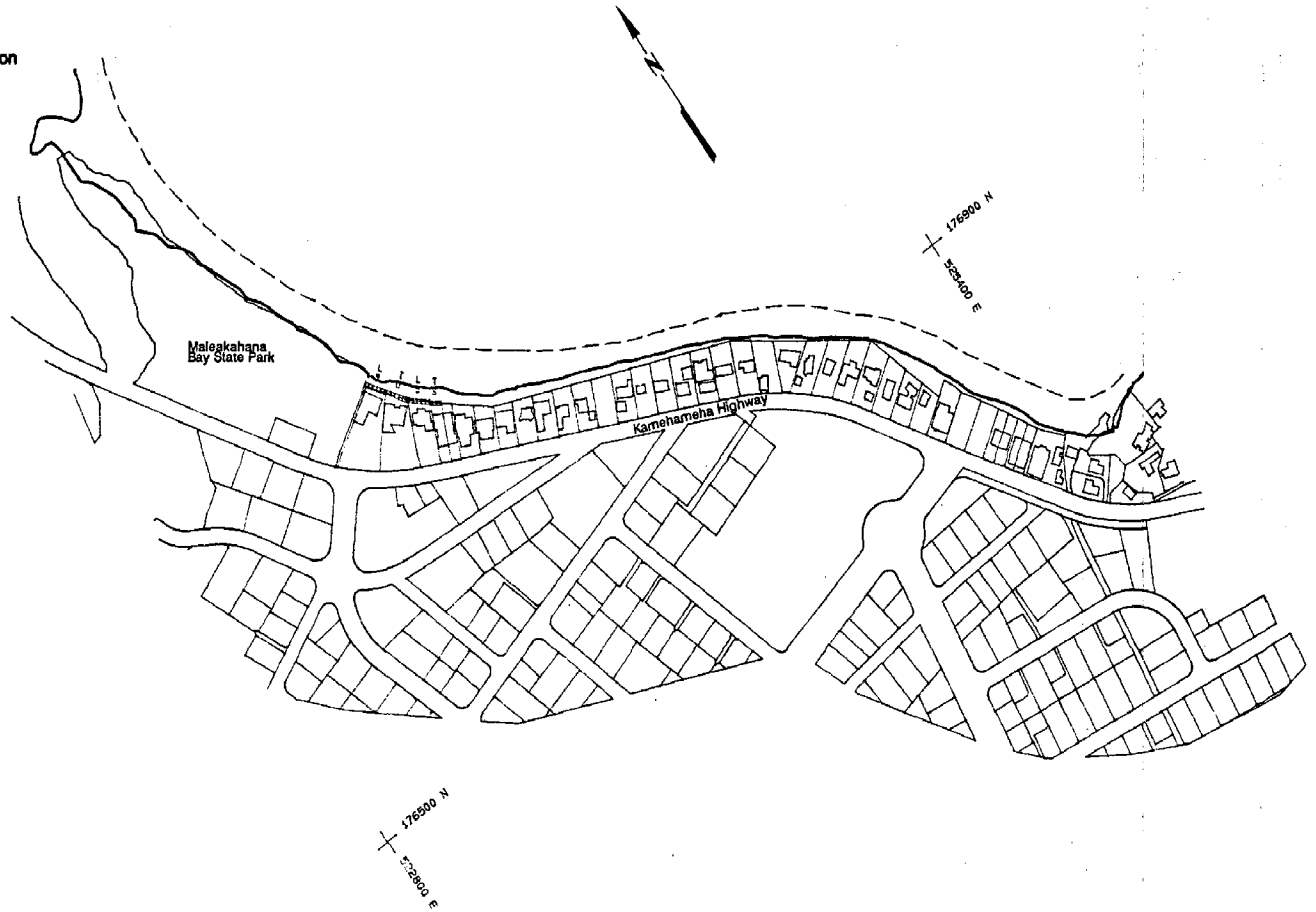

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FIGURE 5-11
LAIE

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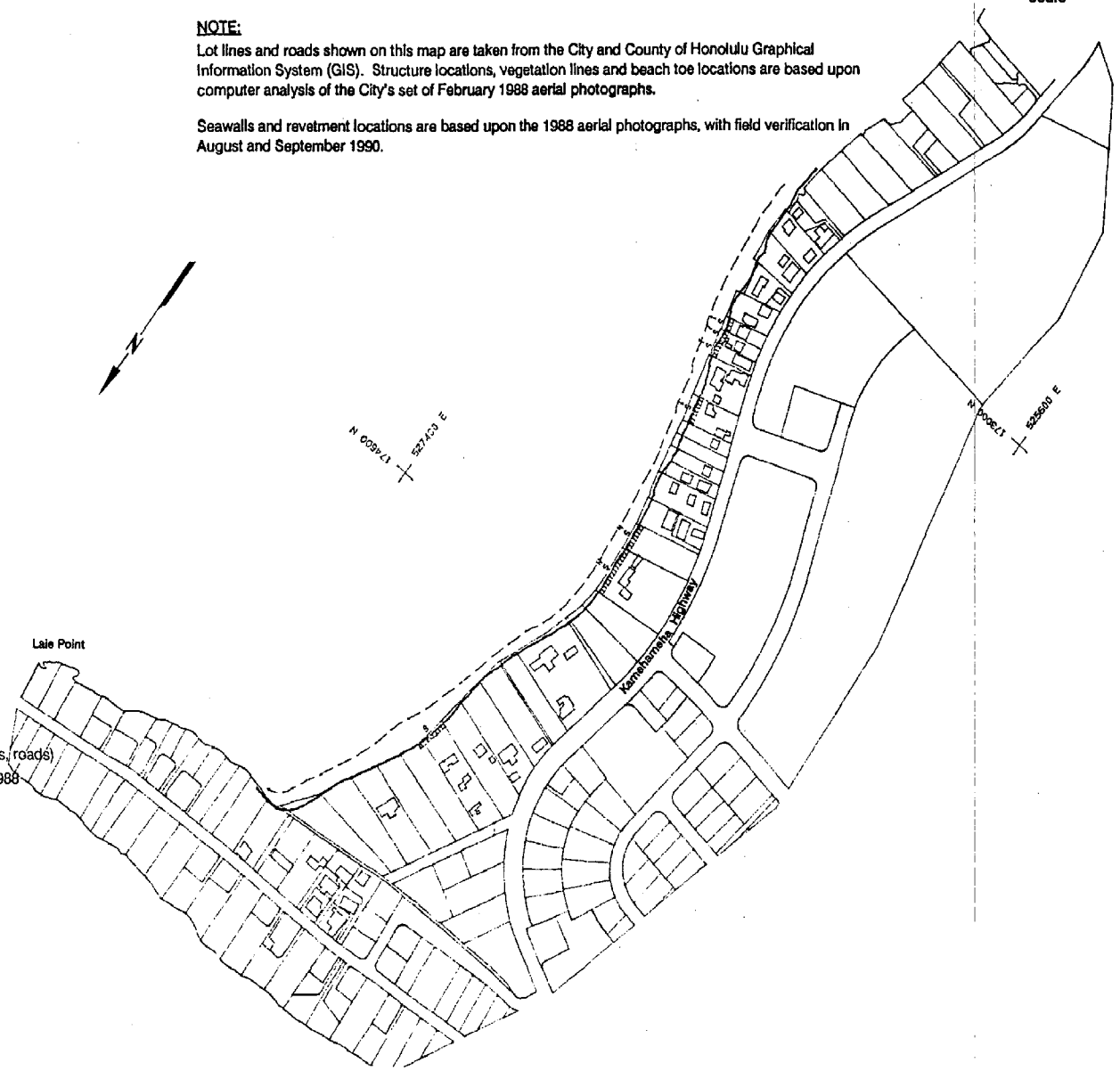

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R = Revetments
O = Other

L,I,N: Legal status of shore protection

L = Legal
I = Illegal
N = Nonconforming

FIGURE 5-12
LANILOA

5.2.F. Kokololio Beach (Kokololio #1 - Figure 5-13)

Kokololio is located between Paki Kilo Ia and Kaipapau Point and means "creeping horse," taking its name from a peculiar wind that blows from the mountains in this region in very sharp, vigorous gusts. The long, curving sand beach of Kokololio is one of the most beautiful shorelines in this area of Oahu, and popular recreational activities include beachcombing, shorecasting, bodysurfing and swimming.

This 2,900-foot-long sector is at the north end of Kokololio Beach. The backshore is zoned R-5 and is approximately 50 percent developed. The beach is relatively wide and the transect data indicate that the beach is either stable or accreting. The houses are set well back from the shoreline. At the south end of this sector, there is a 600-foot-long stretch of beach with the backshore zoned preservation. This is one of the few beaches between Laie Point and Kualoa Point that is not eroding or protected by seawalls.

5.3 Koolaupoko District

Kailua Beach (Figures 5-14 and 5-15)

Kailua Beach is a high-quality stretch of sandy shoreline between the rocky points of Kapoho on the north and Alala on the south. Kailua is usually translated as "two currents in the sea." In addition to its scenic beauty, it offers a wide range of recreational activities including boating, diving, sailing, snorkeling, board surfing, bodysurfing, and swimming.

The northern 11,000 feet of the beach is fully developed with single-family dwellings, and the southern 2,800 feet is dedicated to park use.

The beach, especially at the north end, is very dynamic, with periodic significant erosion or accretion. The middle section of the beach is presently accreting. To date, there as been no significant shore protection placed on the beach.

5.4 Honolulu District

5.4.A. Portlock (Figure 5-16)

The Portlock shoreline seaward of the old Henry Kaiser Estate is rocky, with no sand beaches. Moving toward the Hawaii Kai Marina entrance channel from the Kaiser estate, the next 4,000 feet of shoreline is protected by vertical seawalls. There is little or no sandy beach remaining and lateral access is restricted.

LEGEND:

——— On shore features (lots, buildings, roads)

——— Vegetation line as of February 1988

– – – Beach toe as of February 1988

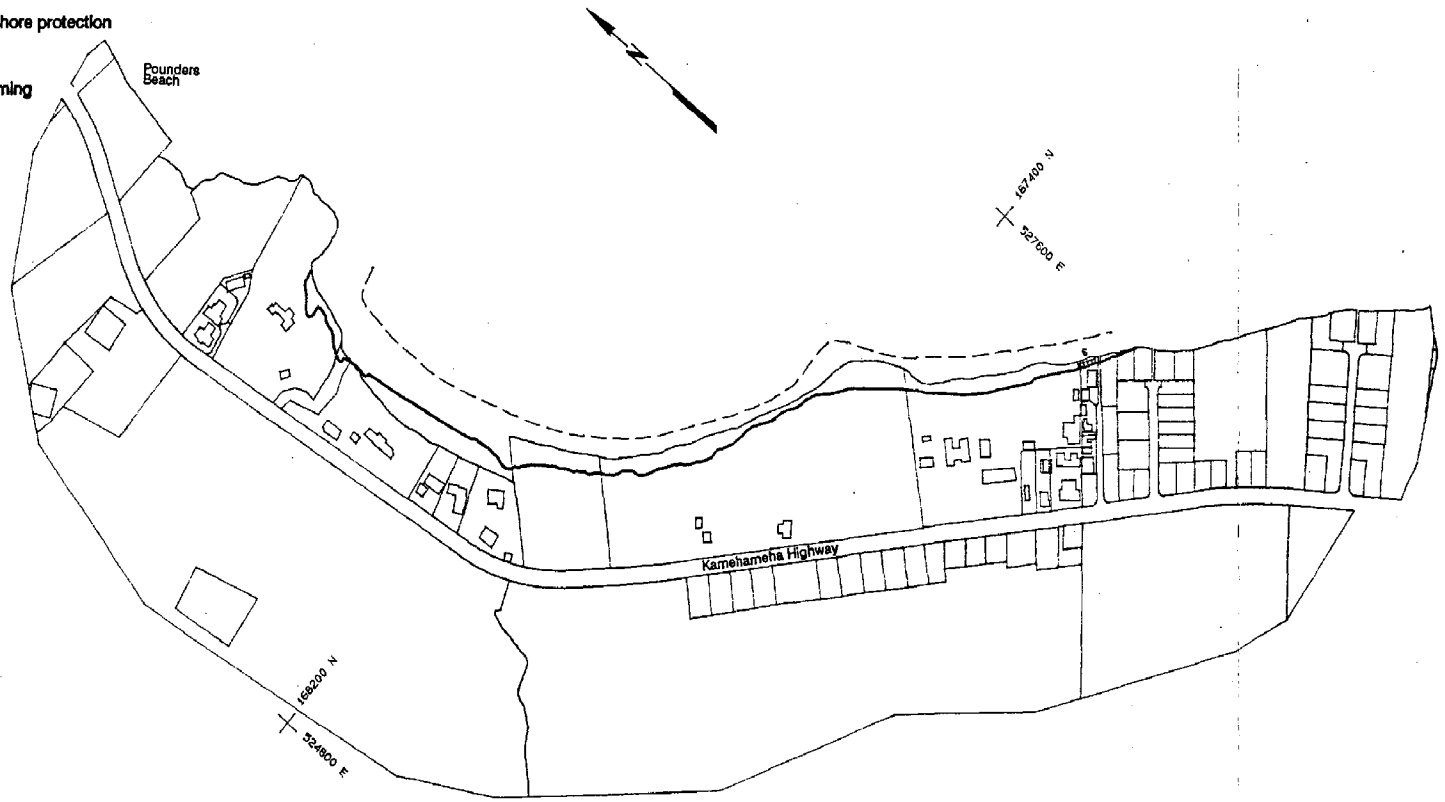
▨ Shore Protection

S, R, O: Type of shore protection
- S = Seawalls
- R = Revetments
- O = Other

L, I, N: Legal status of shore protection
- L = Legal
- I = Illegal
- N = Nonconforming

1"=400' scale

400 0 400 800 feet



NOTE:

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FIGURE 5-13
KOKOLOLIO

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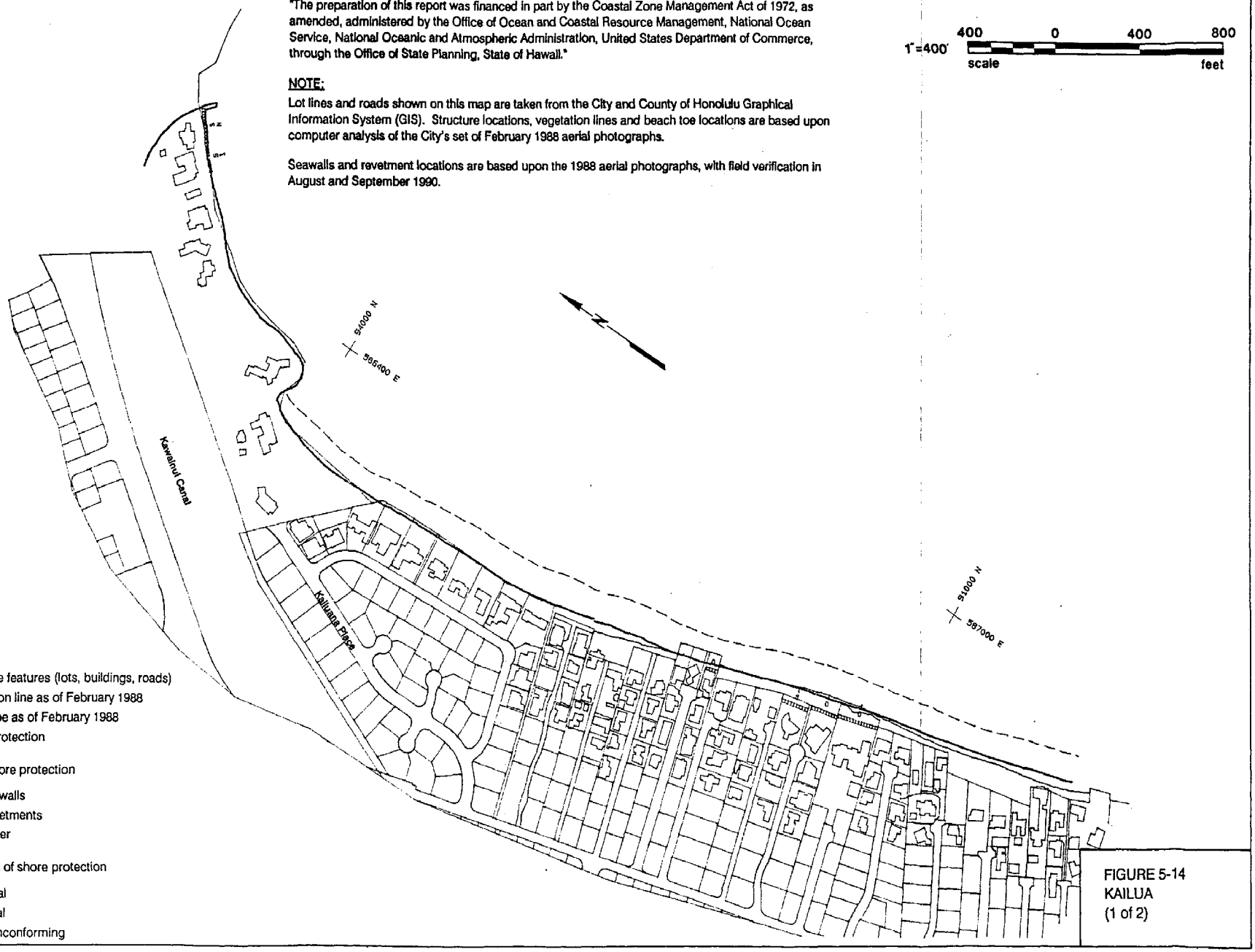

LEGEND:

- On shore features (lots, buildings, roads)
- Vegetation line as of February 1988
- Beach toe as of February 1988
- Shore Protection

S,R,O: Type of shore protection

- S = Seawalls
- R = Revetments
- O = Other

L,I,N: Legal status of shore protection

- L = Legal
- I = Illegal
- N = Nonconforming

FIGURE 5-14
KAILUA
(1 of 2)

LEGEND:

——— On shore features (lots, buildings, roads)

——— Vegetation line as of February 1988

– – – Beach toe as of February 1988

▨ Shore Protection

S, R, O: Type of shore protection
- S = Seawalls
- R = Revetments
- O = Other

L, I, N: Legal status of shore protection
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- N = Nonconforming

400 0 400 800

1"=400' scale feet

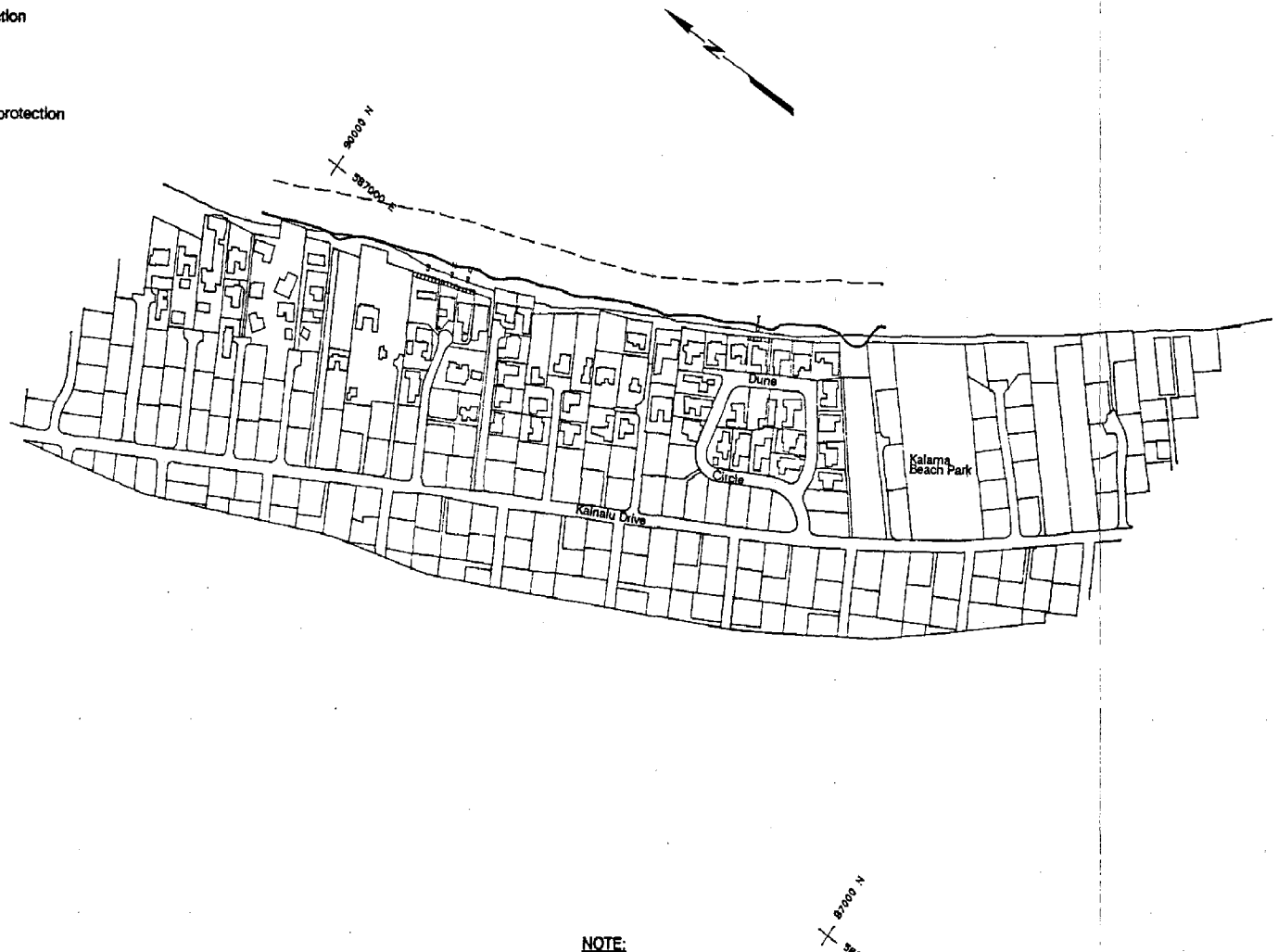

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FIGURE 5-15
KAILUA
(2 of 2)

LEGEND:

——— On shore features (lots, buildings, roads)

——— Vegetation line as of February 1988

– – – Beach toe as of February 1988

▨ Shore Protection

S, R, O: Type of shore protection
- S = Seawalls
- R = Revetments
- O = Other

L, I, N: Legal status of shore protection
- L = Legal
- I = Illegal
- N = Nonconforming

1"=400' 400 0 400 800 scale feet

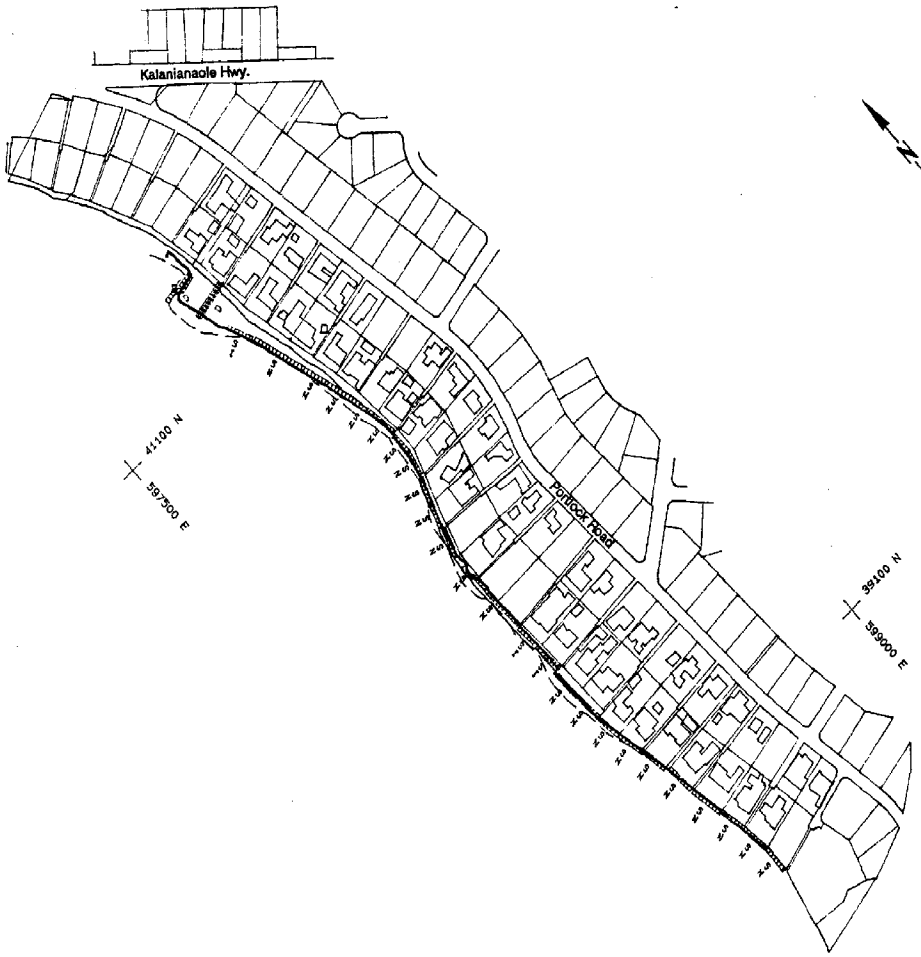

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FIGURE 5-16
PORTLOCK

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The remaining 1,300 feet of the shoreline is sandy, with no shore protection structures. The sand transport along this shoreline is essentially unidirectional, with the transport towards the marina entrance channel. This results in chronic erosion at the east end of the sector, some accretion at the west end, and shoaling of the marina channel. This shoreline was greatly influenced by the extensive dredging associated with the Hawaii Kai development, particularly the dredging of the 200-foot-wide channel under the bridge in the 1960's. The new channel started to fill in immediately after the dredging was completed, and there was corresponding erosion of the Portlock shoreline.

5.4.B. Kahala (Figure 5-17)

A commonly accepted meaning of Kahala is "the amberjack fish." Kahala Beach is a long and narrow stretch of sand extending from the Waialae Beach Park to Black Point, a distance of 6,000 feet. Diving, pole fishing, snorkeling, board surfing, swimming and throw-netting are popular activities in this area.

The backshore is zoned residential and is completely developed with single-family dwellings. The eastern 3,500 feet of the beach is 20 to 30 feet wide, has adequate lateral access, and no shore protection structures. This is the area shown in Figure 5-17.

The 2,500 feet of shoreline at the west end of the beach is completely protected, primarily with vertical seawalls, but there are some rock revetments. The beach sand is almost completely gone from this sector, and lateral access is restricted.

Based upon evidence in the aerial photos and shoreline observations, it appears that the predominant sand transport is toward the east. If this is the case, the shoreline just east of the protected area will erode, as the littoral current suspends and transports the first available beach sand. If this occurs, the seawalls will continue to spread eastward along the beach. This has been the pattern over the past several years.

This beach area has good public access to the shoreline and is a fairly popular recreational area. It is the only beach easily available to residents (easy parking) between Ala Moana Park and Sandy Beach.

5.5 Waianae District

5.5.A. Maili Beach (Figures 5-18 to 5-19)

Maili is a contracted form of maili'ili, which means "lots of little pebbles." It is a long stretch of shoreline extending from Maipalaoa Stream on the south to

LEGEND:

——— On shore features (lots, buildings, roads)

——— Vegetation line as of February 1988

– – – Beach toe as of February 1988

▨ Shore Protection

S, R, O: Type of shore protection
- S = Seawalls
- R = Revetments
- O = Other

L, I, N: Legal status of shore protection
- L = Legal
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- N = Nonconforming

400 0 400 800

1"=400' scale feet

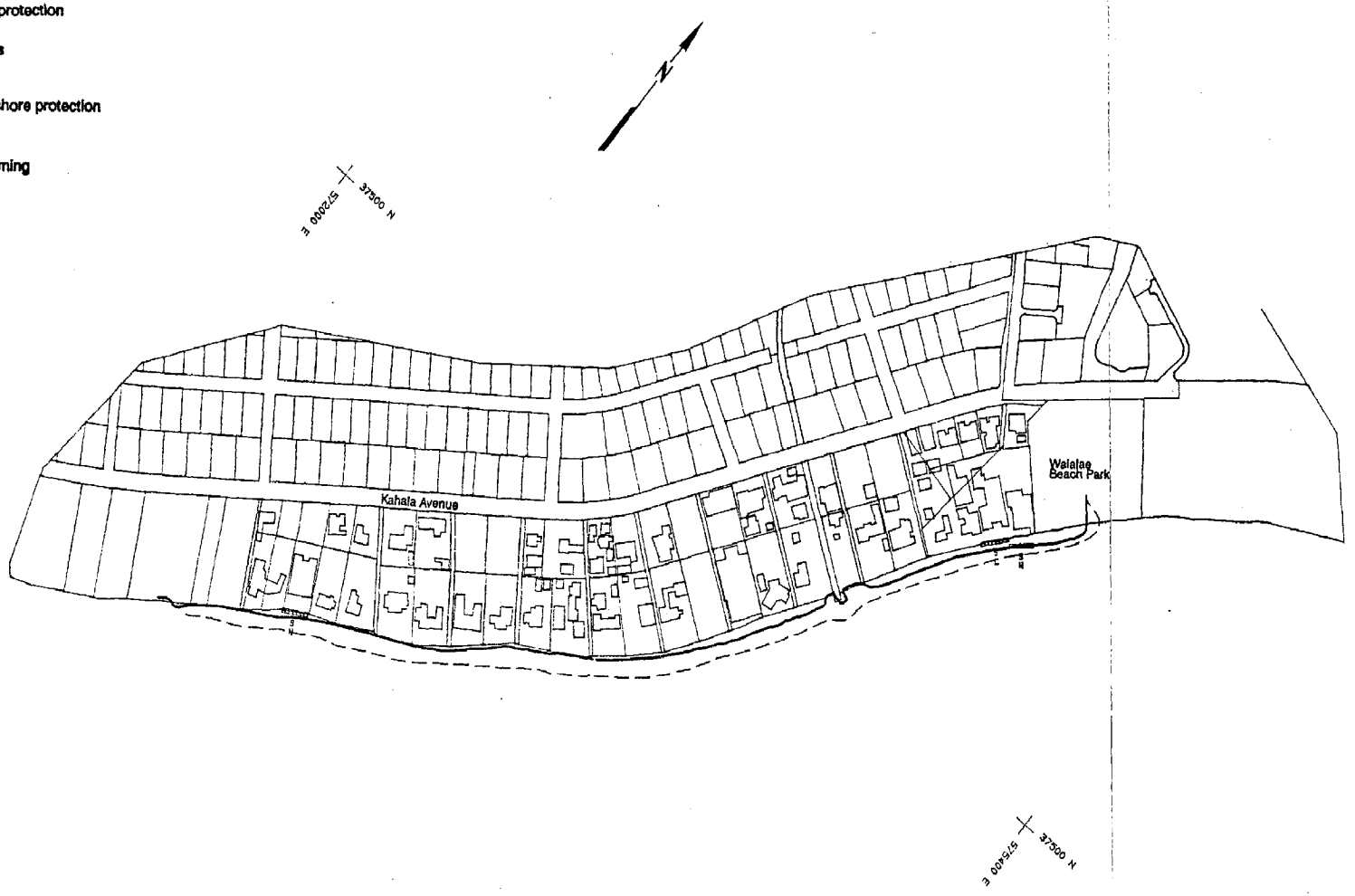

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FIGURE 5-17
KAHALA

LEGEND:

——— On shore features (lots, buildings, roads)
——— Vegetation line as of February 1988
– – – – Beach toe as of February 1988
▨ Shore Protection

S, R, O: Type of shore protection
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L, I, N: Legal status of shore protection
L = Legal
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1"=400' 400 0 400 800
scale feet

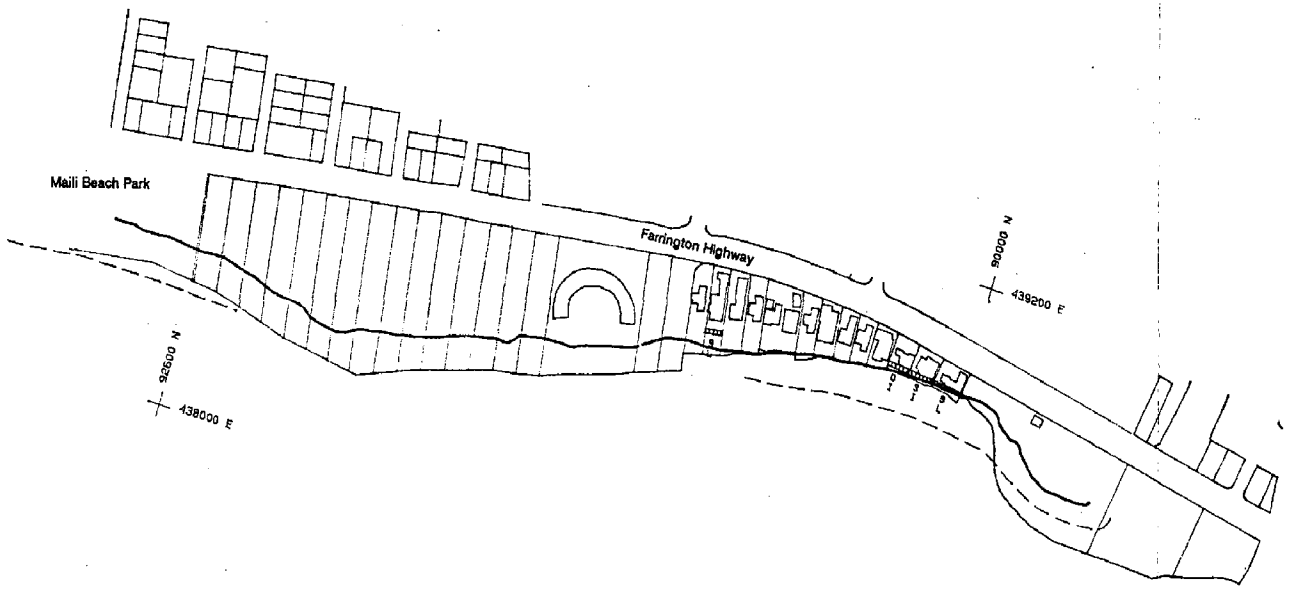

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FIGURE 5-18
MAILI (1 of 2)

LEGEND:

——— On shore features (lots, buildings, roads)
——— Vegetation line as of February 1988
– – – Beach toe as of February 1988
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L, I, N: Legal status of shore protection
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400 0 400 800
1"=400' scale feet

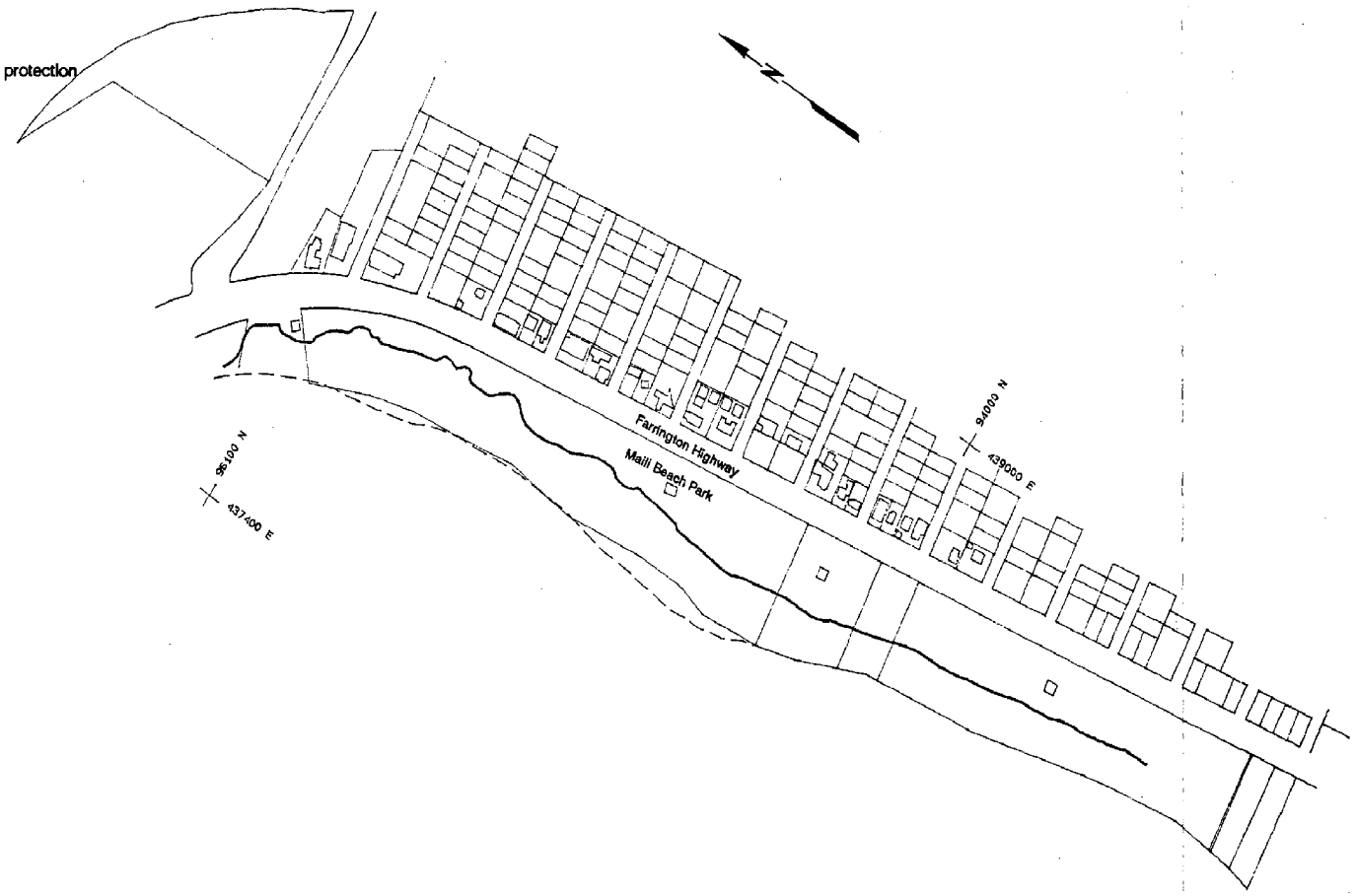

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FIGURE 5-19
MAILI (2 of 2)

Maili'ili Stream on the north, a distance of 7,000 feet. Recreational activities include diving, board surfing, and swimming.

At the south end of the sector, there is a 500-foot-long outcropping of limestone, with no sand beach. North of the outcropping, there is a 1,500-foot-long residential area, consisting of single-family dwellings and one condominium, the Maili Cove. The remaining 5,000 feet of coastline is Maili Beach Park. Park facilities are limited to comfort stations and parking lots.

The two ends of the sand shoreline (the northern 3,000 feet of the park and the south end of the residential area) are subject to chronic, severe erosion. Over the past 40 years, the vegetation line has receded from 22 to 100 feet at these locations.

At present, there is an extensive beachrock or limestone outcropping at the toe of the beach along the entire residential area. The shelf limits the recreational potential of this area, since it makes access to the water difficult. It should, however, eventually help to stabilize the shoreline against erosion. The beach becomes more narrow to the south, the house lots become shallower, and the last four houses are located close to or on the vegetation line, with two of them protected by vertical seawalls.

The central part of the beach accreted over the past 40 years, with the vegetation line in front of the condominium moving 70 feet seaward.

5.5.B. Mauna Lahilahi Beach (Figure 5-20)

Mauna Lahilahi ("thin mountain") provides recreational opportunities for diving, pole fishing, board surfing, and swimming. It is a 2,000-foot-long beach, located just south of Lahilahi Point. The beach was either stable or accreting from 1949 to 1977, but then eroded severely between 1977 and 1988, probably due to the effects of Hurricane Iwa in 1982.

At the north end of the beach, there is a 400-foot residential sector, and houses have been built on three of the six lots. There is presently no shore protection in place, but the houses are either at, or close to, the vegetation line. In the center of the beach, the highway is close to the beach crest. A public park is located at the south end.

5.5.C. Makaha Beach (Figure 5-21)

Makaha Beach is approximately 3,300 feet long, and is bounded on each end by a rocky shoreline. It is a renowned surfing beach, rich in legends, and also provides recreational opportunities for diving and swimming.

LEGEND:

——— On shore features (lots, buildings, roads)
——— Vegetation line as of February 1988
– – – Beach toe as of February 1988
▨ Shore Protection
S, R, O: Type of shore protection
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400 0 400 800
1"=400' scale feet

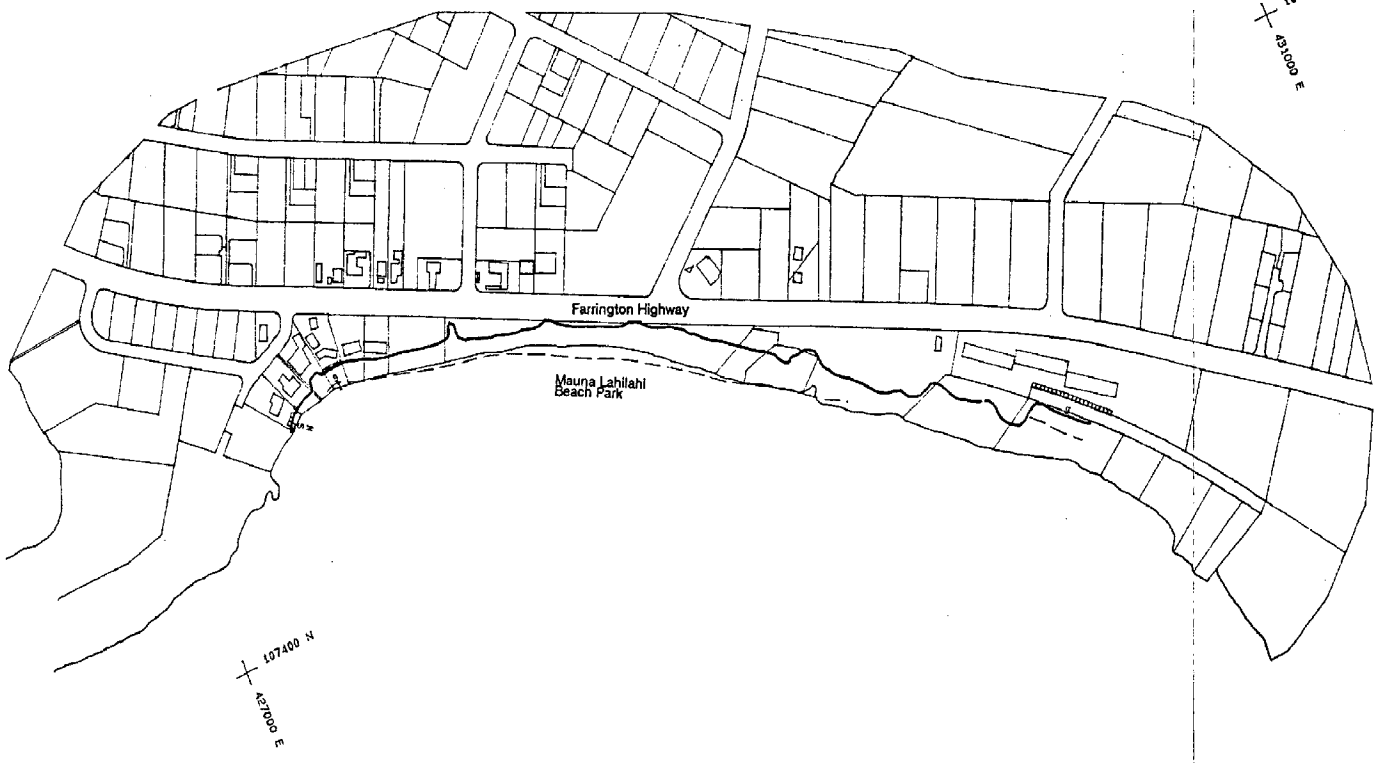

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FIGURE 5-20
MAUNA LAHILAHI

LEGEND:

——— On shore features (lots, buildings, roads)
——— Vegetation line as of February 1988
– – – – Beach toe as of February 1988
▨ Shore Protection

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1"=400' 400 0 400 800 scale feet

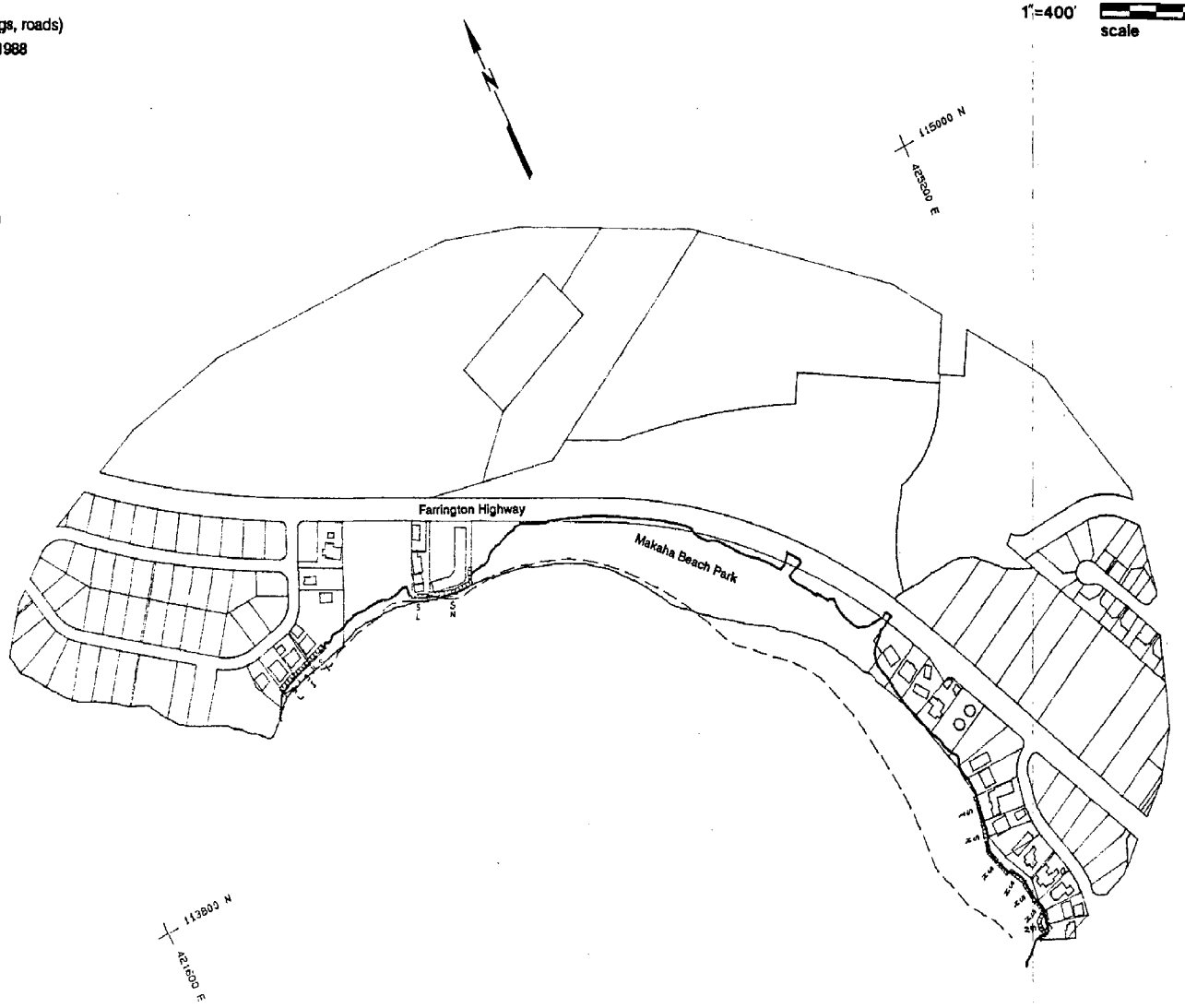

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FIGURE 5-21
MAKAHA

The northern end of the beach is zoned for residential and apartment use, the southern end for residential, and the central section is dedicated to park use.

The north end of the beach has eroded 20 feet over the past 10 years, and the apartment building separating the north residential area from the public park, now protrudes seaward of the adjacent vegetation lines. During much of the year it acts as a groin, isolating the north sector of the beach. This sector is 800 feet long, with 450 feet developed and 350 feet still vacant. The developed area is protected, except for one house, by vertical seawalls.

This sector has extensive beachrock outcroppings at the toe of the beach, and the beach is "perched" between the outcropping and the vegetation line. It consists of poorly-graded sand with a high percentage of rubble. The existing shore protection is located well back from the perched beach.

Makaha Beach Park is located along the central 1,500 feet of the beach. The beach in this area varies greatly between summer and winter seasons due to the variation in wave climate. In addition to the seasonal trends, there may be longer cycles of erosion/accretion, and in recent years the beach has been eroding. The public bath house at the park has been repeatedly damaged by large winter surf. At one time, the U.S. Army Corps of Engineers was investigating the feasibility of shore protection in this area. Lately, some consideration has been given to realigning Farrington Highway to allow the beach to fluctuate naturally.

The backshore of the southern 1,100 feet of the beach is zoned residential and is fully developed. The variation in beach conditions between a February 1988 photograph and a June 1989 site visit indicates that the summer sand transport is to the north. In June 1989, only the first three houses next to the beach park were fronted by a sandy beach. Along the remaining 900 feet, the beach had been cut away to the point that the shoreline consisted of a five-to ten-foot-high limestone shelf with only a narrow strip of sand behind. Two houses in the group are protected by vertical retaining walls, but they have no apparent effect on the littoral processes.

6. ALTERNATIVE REGULATORY APPROACHES

6.1 Retaining "Status Quo" (40-Foot Setback)

Advantages

In some specific cases, retention of the existing 40-foot setback is the most rational alternative. For example, there are at least three circumstances in which the existing 40-foot setback may be considered appropriate: where there are rocky shorelines, where the predictability of future erosion is determined to be relatively slow, and where the area is already fully developed and committed to shoreline protection.

Maintaining status quo also has two other overall practical advantages:

a. It is relatively easy to administer and enforce. This is an advantage which should not be discounted, since without effective monitoring and enforcement, the most well-intentioned beach preservation strategy will not produce the desired results.

b. It provides a degree of predictability to those purchasing and attempting to develop or redevelop shoreline properties. The 40-foot shoreline setback is an accepted restriction on shoreline properties. If setbacks varied from property to property, the restrictions might not be as widely-known or acknowledged.

Disadvantages

The primary disadvantage is also found in its basic simplicity. No explicit rationale has been found for the 40-foot restriction, and there is no evidence that specific beach erosion dangers were taken into consideration in establishing the setback. The City and other counties have always had the option of increasing the setback, but none has ever succeeded in doing so, perhaps because of the great diversity in beach conditions and in the lack of technical data and available expertise in the past to measure and rationally respond to these diversities. An additional factor on Oahu was public opposition, supported by legislative action [i.e. Bill No. 7-90, an Interim Development Control Ordinance for increased shoreline setbacks), which resulted in the filing of the Bill by the City Council after a small, vocal group of North Shore residents opposed it because of what they saw as a decrease in property values and infringement on property rights.

6.2 Increasing Shoreline Setbacks

Advantages

The advantage of increasing shoreline setbacks for areas where there is long-term, chronic erosion of sandy beaches or where cyclical storm damage causes severe erosion is that this would provide a site-specific method of beach preservation. Some degree of subjectivity would be inherent in this alternative, but it is a regulatory approach and therefore flexible enough to respond to changing conditions or new data inputs as they are made available. An increased shoreline setback would accomplish the basic regulatory concern in all existing policies and programs for beach preservation: ensuring that structures are built far enough away from the shoreline to allow for natural beach processes to take place. It would, in that sense, promote the essential policy objective explicitly expressed in all Federal, State, and City policy documents and regulatory controls preserving a public resource of great value, and scarcity, in those areas where the probability of loss of the resource is high.

Disadvantages

a. Nonconformities

When a regulatory control is changed, the inevitable result is the creation of additional nonconformities. These may be either nonconforming structures or nonconforming uses or both. "Nonconforming" means that the structure or use, at the time it was built or established, complied with all regulations in effect **at that time**, but no longer does. While a nonconformity is not illegal, the creation of nonconformity imposes burdens on agencies responsible for administering and enforcing regulations and on the property owner whose structure or use no longer conforms to current regulations.

Agencies, when nonconformity is created, must monitor future actions for compliance with restrictions on these uses and structures. Often, especially with older structures and uses, it is difficult to ascertain what regulations precisely applied at the time the structure was built or the use established.

The property owner, while allowed to continue the use or structure, faces limited options in the future. Basically, if the structure is destroyed (by more than half its replacement cost), it cannot be rebuilt unless it conforms to current regulations. There are also restrictions on repairs, alterations, and additions, and if a nonconforming use is discontinued for a period of time, it cannot be reestablished.

Oahu's regulations for nonconforming uses and structures are essentially the same as established in all jurisdictions and are designed with the same theory in mind. If policy-makers determine that a public good is served by changing the rules, and the rules are subsequently changed, then the theoretical objective is to eventually force conformance to the new rules and to discourage the continuance of uses and structures which no longer conform. While this is not a well-understood theory by the average property owner, the theory itself is sound.

In practice, however, the existence of nonconforming uses and structures causes hardship, expense, misunderstanding of public objectives, and resentment of governmental regulation.

Increasing shoreline setbacks will create new nonconforming conditions; specifically, it will make a number of structures, including dwellings, nonconforming, because they are built within the new, enlarged setback area. It should be noted that the structures — legally built — are legally permitted to remain, but the restrictions on replacement, etc., described above will apply.

This particular disadvantage in increasing shoreline setbacks, or in any other regulatory change discussed, cannot be fully resolved. There are, however, two critical criteria which should be considered within this context:

(1) The "change in rules" should clearly serve the greater public good and be formulated in a fair and equitable manner, not, for example, rewarding a select few at the expense of the majority.

(2) The degree of nonconformity created, relative to the public purpose achieved, should be relatively minor. (This, of course, is not easily determined, but it should be seriously considered in any change to regulatory controls.)

b. The "Taking" Issue

Government is prevented from taking private property for public use without paying just compensation by the Fifth Amendment. In general, a land use regulation must pass two tests to avoid a taking. It must substantially advance a legitimate government interest, and it must not deny a property owner an economically viable use of his or her land. It is important to note that the question in a taking issue is not just the legitimacy of the government's interest; it must be deter-

mined that the **means** chosen by government actually does "substantially advance" its legitimate interest.

Regulatory strategies, specifically an increase in shoreline setbacks, may raise the taking issue, since it might be argued that prohibiting development on a portion of the private beachfront property is tantamount to a physical occupation, or taking, by government and that just compensation for the increased setback area is therefore due. On the other hand, if it is shown that the increased setback substantially advances the government's legitimate interest, e.g. preserving a valuable, but limited public resource, then no taking has occurred, and no compensation is due.

It is not possible to predict the outcome of a taking challenge in considering increased setbacks on Oahu's beaches, because the issues from case to case will differ and will almost always be complex. It is possible to consider patterns which have evolved on the taking issue by examining recent (1989-1990) court rulings in other states. The following is a summary of some rulings which are relevant to this particular regulatory strategy for beach preservation, drawn from the "Land Use Law and Zoning Digest."

a. In New York, an agency's action to identify certain areas as "coastal erosion hazard areas" was deemed not to be a taking. The court stated that the identification of certain areas as coastal erosion areas did not create a basis for challenge of the regulations as unconstitutional and that the action of identifying these areas, standing alone, did not constitute a taking. (February 5, 1990)

   Simply identifying an area as subject to erosion and loss is not apparently subject to serious legal challenge, and it is a widespread practice among coastal states. (Refer to the description of Florida's beach preservation program in Section 4.) There must, of course, be a credible technical basis for the action.

b. A New Jersey court ruled that special restrictions on the development of land determined to be "a unique ecologically sensitive area," did not constitute a taking. The court ruled that there was a rational basis for the more stringent regulations, because the area was ecologically sensitive and that measures fairly designed to bar unsuitably intense development were justified. (June 13, 1989)

In coastal states, sandy beaches can certainly be reasonably classified as unique and ecologically sensitive areas, much as certain urban areas can be singled out for special restrictions because of their scenic, cultural, or historical uniqueness. The measures to substantially advance the legitimate governmental interest, however, must be fairly designed.

c. In a case in New Hampshire, the denial of a variance for construction of a house on wetlands was upheld, even though the denial left the owner unable to make "profitable use" of the land. (February 6, 1989)

   In a statement on the taking issue, the court held that in cases where the proposed use of the property is deemed "injurious to the public," the test is whether the regulation thwarts the owner's substantial, justified expectations and whether the burden is unreasonably onerous. (It should be noted that there was legislation in place which strongly expressed a public policy of wetlands protection.)

   In this case, the owner was prevented from realizing a profit from the construction, but not from maintaining status quo. The court did not support a taking claim based solely on the investment risks taken by the property owner in the face of regulatory impediments.

   Legislative intent, strongly expressing a public interest, is a necessary ingredient in avoiding a taking claim. The regulatory means of achieving the intent, of course, must be fairly drawn and substantially advance this public interest. The second test, depriving a private property owner of the economically viable use of his or her land, does not automatically mean that a property owner may purchase land when it is subject to special public interest, and then successfully pursue a taking claim because of restrictions placed upon the land to protect that public interest.

d. An unconstitutional taking claim was lost in Indiana and, while it did not affect beachfront property, the findings in the case succinctly express considerations in the taking issue:

   (1) The court stated that a land use regulation does not effect a taking if it substantially advances a legitimate state interest and does not deprive an owner of economically viable use of his property.

(2) The court noted that whether a regulation deprives an owner of economically viable use of his property involves consideration of the owner's investment-backed expectations, the diminution of land's value, the extent of interference with the land's present use, comparison of the property as a whole with the portion encumbered by the regulation, and the nature and character of the interference.

(3) The court stated that the test is essentially whether the government has regulated to an extent that the owner has been effectively deprived of productive use of his or her property.

Two other aspects of this particular case are relevant to beach preservation strategies, from a regulatory standpoint: the private property action proposed involved land on which there were archaeological sites, and a mitigation plan had also been proposed by the government agency challenged on the regulatory restrictions.

The court held that protecting a legitimate state interest, e.g. the archaeological sites, was valid and that the end was served by means of the regulatory device employed in this case, and the mitigation plan. It also stated that regulations need not accomplish "all possible ends" in attempting to further the governmental interest.

While the specter of a legal challenge to any change in existing shoreline regulations aimed at preserving Oahu's beaches is real, and it may be considered "disadvantageous," it is by no means a legitimate obstacle to pursuing regulatory change. A challenge based on taking is not easily won when a clear public interest is carefully, and substantially, advanced by a change in regulatory controls.

6.3 Prohibiting Shoreline Protection Structures

Advantages

Seawalls and revetments are the most commonly used shoreline protection structures on Oahu. Some of them were erected legally and some, approximately 41 percent within the study area, were illegally constructed. (Illegal structures are those constructed after 1970 without a permit.) In addition, approximately 30 percent of the structures were legal at the time they were constructed, but are now nonconforming. They could not meet current standards and regulations.

There is a consensus among sources that this common form of protecting private, beachfront property is not the preferred alternative. According to *Shoreline Protection in California,* the following scenario is likely to occur:

> **"For beaches subject to continued erosion, bulkheads (seawalls) do not provide a long-lived permanent solution, because eventually a more substantial wall is required as the beach continues to recede and larger waves reach the structure. While seawalls may protect the upland, they do not hold or protect the beach which is the greatest asset of shorefront property. In some cases, the seawall may be detrimental to the beach in that the downward forces of water, created by the waves on striking the wall, rapidly remove sand from the beach."**

Ironically, the shoreline "protection" structure, designed to protect the owner's considerable investment in beachfront property is itself sometimes destroyed by the natural forces continually at work, including wave and wind action or severe storms. According to the *Hawaii Shoreline Erosion Management Study,* a common cause of failure is inadequate design and the structure may be lost or severely damaged. The property protection intended is not achieved, and an unintended but long-term negative effect is inflicted on the chief "value" of the investment itself — the adjacent beach.

Within this context, the advantage in prohibiting shoreline protection structures on vulnerable Oahu beaches is clear. In the technical sense, they are often ineffective in protecting the private interest anyway, and they are often a contributing factor in the loss of a valuable public resource.

Disadvantages

The disadvantages are equally clear. The public and private impacts of creating nonconforming structures are discussed in Section 6.2 above. Prohibiting new shoreline protection structures, as of a certain date, would render all existing structures nonconforming.

Broad, indiscriminantory prohibition would not only create a greater degree of nonconformity, but would not always create a better beach preservation environment. There are certain areas which are already fully committed to shoreline protection structures. Prohibiting them in these areas would not accomplish anything positive toward preserving the adjacent beach.

Alternatives to a broad-brush attack on shoreline protection structures erected by private land owners, would be to:

a. ease regulatory restrictions on other types of structures, e.g. small, open structures which would facilitate sand entrapment without damaging the natural processes at work in the area;

b. controlling the design and uniformity of seawalls in areas where the beachfront is already heavily developed and fully committed to this type of protection (thereby protecting adjacent property owners and the beach itself); and

c. selectively targeting certain areas where the beach is vulnerable, but no major commitment has yet been made, for a prohibition strategy.

Areas where these alternatives can and should be exercised on Oahu are discussed more fully in Section 8.

6.4 Increasing Minimum Lot Areas for Residential Shoreline Properties

This regulatory approach has been considered in the past and was evaluated in this follow-up study, but was rejected because the disadvantages appear to outweigh any advantage to be obtained at the present time.

The advantage in increasing minimum lot areas for residentially-zoned shoreline parcels would be to avoid creation of narrow, shallow lots where even the existing 40-foot shoreline setback imposes a significant development constraint. Current residential zoning (R-5 and R-3.5) would permit lots of 5,000 and 3,500 square feet on the shoreline, respectively. Small-lot subdivisions on the shoreline create obvious hardships for individual owners, especially if setbacks were to be increased for beach preservation. This situation then promotes more requests for "variance" from regulatory controls or encourages illegal shoreline protection measures by individual property owners.

On the other hand, most areas within the study area are already fully developed. While there are small pockets of opportunity left in certain areas, the major advantage to creating larger-lot subdivisions is largely lost. To prevent smaller-lot development at this point in time would require either "spot rezoning" action, which is not considered a desirable regulatory approach, or large area-wide rezonings which would undoubtedly create a number of nonconformities. (See Section 6.2 above.)

Because the benefit to be gained does not appear to outweigh the problems created, this alternative is not considered feasible.

6.5 Creating a Beach Preservation (Overlay) District

This is an alternative which has also been discussed in the past and which has ample precedent in existing regulatory controls aimed at "preserving" a certain resource, e.g. historic, cultural, or scenic, on an area-wide basis. For example, Article 7. of the Land Use Ordinance (LUO) contains special district regulations for seven areas of Oahu, in addition to regulations governing federally-established Flood Hazard Districts.

In some cases, the regulations are an "overlay" on existing zoning requirements, and in others they supplant and supersede underlying zoning. In each case, they are tailored to control a specific concern or concerns within the area selected.

Advantages

In general, the advantage to using an "overlay" approach is that specific concerns can be more easily addressed than in the more traditional, broad-brush approach contained in a zoning ordinance. Legislative intent and objectives specifically focused on the problem, the public concern, can be expressed in a manner which property owners within the area can more easily identify with and support.

For example, to carry out a beach preservation strategy in this approach would mean establishing an "umbrella" Beach Preservation District with broad intent and objectives under which site-specific "precincts," or beach sectors could then be established. The diversity of Oahu's beaches and differing objectives would most likely require several established sectors.

Within each sector, specific concerns could be addressed in the fashion most appropriate for that sector. Setbacks could be established, guidelines for the most appropriate type of shoreline protection structure (in terms of type and uniformity in design) could be incorporated, and other regulatory matters, such as treatment of illegal seawalls, could also be included. The regulatory flexibility available under an overlay district approach is an attractive advantage.

Another advantage is that an established regulatory mechanism already exists for this approach. It is a tested means of preservation and control and one for which there already exists precedent and administrative experience at the City level; for example, "overlay" controls have been administered for sometime in Special Districts such as Waikiki and Chinatown.

Disadvantages

Despite the obvious advantages to adapting an existing regulatory mechanism to the beach preservation objective, creating a new "District" would still mean adding an additional layer of regulation to the shoreline. While it may be possible to streamline or even merge this type of regulatory approach with the Shoreline Management Area and Shoreline Setback regulations, it would still mean a new set of "rules" governing property owners with beachfront parcels.

As noted above, this is an approach which has been fully tested and has been shown to work. However, creating special district regulations has never been an easily accomplished task. The intent and public objectives of such a district must be carefully drawn and specific regulations within the district must be thoughtfully and equitably constructed to carry out those objectives. A great deal of public input and discussion has preceded the establishment of each of the existing special districts and the same type of education and outreach would be required for a beach preservation district.

Finally, this approach is regulatory and would not in itself provide for the type of non-regulatory strategies, such as beach replenishment, which may actually be required for effective long-term preservation; they could be addressed, however, if an Improvement District were established. Elsewhere it was noted that other studies have recommended exploring the possibilities of using an Improvement District in which public and private monies would be used to pursue non-regulatory strategies. Ideally, a combination of the regulatory (overlay district) approach with the Improvement District (assessment) approach could be used to more effectively accomplish the objective; however, this hybrid approach would likely be difficult to achieve without a long-term investment in and commitment to both the funding required and the need for public consensus.

6.6 Increasing Monitoring and Enforcement Efforts

There is a generally negative public perception about governmental monitoring and enforcement efforts in the past. While this perception is unfortunate, it is not entirely unfounded. The high percentage of illegally-built seawalls within the study area is one manifestation of an inconsistent effort in this regard.

On the other hand, there have been and continue to be a number of serious restraints on monitoring and enforcement within shoreline areas in general and along the beachfront specifically. As has been noted previously, without a

solid technical data base, taking into account the fragility and diversity of our beaches, regulators lacked a basis for vigorous enforcement. The lack of coastal engineering expertise was another, continuing obstacle.

Staff shortages and a lack of commitment in public expenditures specifically directed toward monitoring and enforcement, as opposed to policy formulation and regulations development, are other reasons why there has often been a vague, ineffectual link between beach preservation policy and actual enforcement of regulatory controls created to pursue preservation.

Finally, overlapping jurisdictions, the complexity of the existing regulatory regime, and differing priorities among the various levels of government agencies involved do not aid, and probably actually impede, enforcement efforts.

In recent years, some significant progress has been made to strengthen monitoring and enforcement. For example:

a. The technical data base has been greatly improved, giving regulators a more comprehensive framework for both the formulation of preservation controls and a technically solid basis for enforcing existing regulations. This base includes the data gathered and mapped as a result of the *Oahu Shoreline Study* and the City's seawall inventory. Computerized mapping capabilities have also greatly contributed to data-gathering and analysis efforts.

b. The administrative approach to enforcement (commonly referred to as the "civil fines system"), as opposed to attempting to prosecute violators through criminal courts, has increased the effectiveness and speed of the enforcement effort. This system is now used for building and zoning violations and violations within the Special Management Area. It is also now being applied to the enforcement of Shoreline Setback violations.

The remaining problems are in large part a function of inadequate funding specifically focused on this area of concern. Until that commitment is made, enforcement is likely to lag far behind policy intent. Monies will be needed to recruit a larger, technically-qualified staff, to maintain and increase the technical data base, to monitor public and private development within the setback area, and to administer a civil fines system.

Within the scope and context of this study, increasing monitoring and enforcement efforts is not really an "alternative," in the sense that there are other rational options. Regardless of the beach preservation strategies

selected, if they cannot be effectively enforced, the objective will not be achieved.

7. NON-REGULATORY PRESERVATION STRATEGIES

There are a number of traditional non-regulatory methods of beach preservation which are common in other states and which are explored in general in this Section. It should be noted that not all of these may be appropriate for Oahu, that the specific method selected would depend on the nature of the erosion problem and quantifiable characteristics of the particular beach sector, and that non-regulatory strategies are considered a supplemental tool to be used with regulatory controls.

Methods for stabilizing a beach and controlling erosion can be categorized as structures which impede waves and protect erodible materials, or an artificial supply of sand to replenish the sand loss from erosion, with or without structures. In both cases, the objective is to reduce the rate of beach loss.

One of the principal advantages of governmental planning/funding of non-regulatory methods is that separate protection for small sectors of erosion-prone beaches, e.g. to protect individual beach lots within a larger eroding area is difficult, costly, and often ineffective, or even damaging. Comprehensive action which takes into account the loss process over the full length of the eroding beach sector or sectors is more effective and economical in the long-run.

Seawalls and Revetments

These are the shore protection structures of choice on Oahu at the present time. They provide protection on the upper part of the beach, fronting backshore residential development, and serve as a substitute for natural protection processes. Beach lot owners have resorted to this type of "armoring of the shore" by erecting wave-resistant walls of various types, often vertical walls of stone.

A revetment is also a structure which armors the beachfront against wave action with one or more layers of rock or concrete. Revetments serve the same purpose as seawalls, but tend to dissipate wave energy with less damage to the beach than waves striking vertical walls.

Groins

A groin is a barrier-type structure which extends from the backshore into the zone of littoral transport (sand movement). Groins can, in some cases, reduce the rate of sand loss and the rate of beach recession. The basic purpose of a groin is to intercede in the sand movement and to gather sand on the shore; however, this is done at the expense of the adjacent downdrift beach unless the groin is filled with sand to its "trapping" capacity. It is often necessary to

artificially fill the area between the groins with sand, ensuring a supply to downdrift beaches.

Breakwaters

Breakwaters, on- or off-shore barrier-type facilities, also slow or eliminate wave action and thus provide protection for the area behind them. An offshore breakwater, for example, stops wave action and creates a calm water area between it and the beach. However, breakwaters can have both beneficial and detrimental effects on the beach. Because of the lack of wave action, sand is deposited and builds seaward toward the breakwater. The buildup serves as a further barrier, completely damming the sand and depriving downdrift beaches of new sand. Breakwaters are more often used for navigation purposes, e.g. preventing sand from entering a navigation channel, than for small-sector beach preservation. In those cases, sand is often mechanically transferred e.g. by piping it, to replenish areas needing it.

Beach Replenishment/Renourishment

The barrier-type structures can be effective in certain circumstances, but most references agree that the preferred method of protection should be as similar as possible to natural ones. In general, and where practicable, the type of beach protection provided by nature (natural processes unhampered) is the best strategy. This strategy call, for rebuilding of the vulnerable beach artificially, simulating natural processes. For stability of the beach, sand from other sources is periodically added to compensate for deficiencies in the natural supply. This is considered most economical for long stretches of sandy beaches, because the increase of supply benefits the entire beach sector.

Beach dimensions, including height and width of berm and characteristics of the sand required for beach slopes, can be determined and the replenishment program is then designed to withstand erosion sources of a specified degree of severity; however, there are occasions when structures must also be provided to maintain a specific beach shape, or to reduce overall replenishment requirements.

The combination of beach replenishment with protection structures can be costly. According to *Shore-Protection in California*, by Sacramento's Department of Navigation and Ocean Development: "In each case, the cost of such structures must be weighed against the added benefits they would provide. Thus, measures to provide and keep a wider protective and recreational beach for a relatively short section of an eroding shore would require excessive nourishment without supplemental structures such as groins to reduce the rate of loss of material from the widened beach. A long, high terminal groin or jetty is frequently justified at the downdrift end of a beach restoration project to reduce losses of fill into a submerged canyon."

Vegetation is also used to increase sand volume and reduce the rate of erosion. Root systems help bind the soil and provide protective cover for bare sediment. Plant varieties suitable to Oahu's beach environment include Beach Naupaka and Sea Grapes, among others. Re-vegetation of a sandy beach, like sand replenishment, is not a permanent solution, since it will help slow the rate of erosion, but not prevent it.

In Hawaii, all of the non-regulatory (structural and non-structural) methods described above have been used with varying degrees of success. Groins are not used today in residentially-developed beachfront areas, because of overlapping jurisdictions and permit problems. (For a more detailed description of these, a recent reference is *Hawaii Shoreline Erosion Management Study,* Volume 1.) Table 1. is adapted from this study and illustrates preferred preservation strategies for certain types of beaches and summarizes basic cost/benefit considerations.

Section 5. of this report describes the physical characteristics of each beach sector comprising a management plan. Section 8. presents specific recommendations, regulatory and non-regulatory, for each beach.

Table 1.

FACTORS TO CONSIDER IN CHOICE OF APPROPRIATE SHORE PROTECTION/STABILIZATION MEASURE:

FACTOR	PREFERABLE (1)	SUITABLE (2)	NOT SUITABLE (3)
Geological/Physical Shoreline Features			
Case 1: Extensive sandy offshore & beach area	Beach nourishment	Offshore structures Groins Buried structures Revetments	Seawalls
Case 2: Sandy beach but limited offshore sand supply	Beach nourishment, Beach fill with structures	Offshore structures Grains Buried Structures Revetments Seawalls	---
Case 3: Rocky shoreline area	Seawalls	Revetments Beach fill with structures	Offshore structure, Groins Buried structures Beach nourishment

Benefit versus Cost

Case 1: Protection vs. relocation	Consider cost of protection measure versus value of existing improvements or land
Case 2: Total cost vs. benefits	Consider initial construction cost' plus long-term maintenance costs over desired lifetime
Case 3: Intangible costs & benefits	Consider public safety, convenience, aesthetics, social well-being

Adapted from *Hawaii Shoreline Erosion Management Study*, Volume I, June 1989

8. RECOMMENDATIONS

8.1 General

This Section discusses two types of beach preservation strategies, which would form the basis of a regulatory and a non-regulatory plan to prevent further loss of Oahu's public beach resources.

The first type of strategy is considered short-term, relatively cost-effective, and of relatively low impact in terms of dealing with the public resource/private property conflict.

The second type of recommended strategy would employ longer-term, potentially more costly means of preserving Oahu's beaches. In some cases, the impacts on private ownership of lands adjoining threatened beaches could also be more severe. In all cases, long-term strategies will require more time to implement, a potentially greater investment, and a lasting State/City commitment to beach preservation.

Short-Term, Cost-Effective, Low-Impact Strategies.

a. Eliminate the 20-foot shoreline setback, which is now permitted under certain conditions.

   Rationale:

   While the original intent of permitting a 20-foot shoreline setback, under certain conditions, was most likely to provide relief to small or severely-impacted lots, the rationale for continuing to do so is not convincing. The objective should be to prevent the **creation** of lots where accommodating a minimum 40-foot setback imposes use and development problems. Relatively speaking, eliminating the 20-foot setback and requiring a minimum 40-foot setback should not cause severe impacts, since the latter, larger setback has been established in a majority of cases. It should also be noted that the counties have always had the authority under State statute to increase setbacks even beyond the standard 40 feet. Platted lots created prior to the elimination of the 20-foot setback could still be reviewed under the old rule.

b. Require a minimum 3,000 square feet **buildable** lot area for residential beachfront properties.

Rationale:

The purpose here is to further and more directly address the inappropriate creation of residential lots where even the existing shoreline setbacks impose a "hardship" on future use and development. This requirement would effectively prohibit the creation of small, shallow lots in the future and ensure that shoreline setbacks, in combination with other zoning and building requirements, can be realistically met. A "buildable area" would exclude the established shoreline setback, the front, side and rear yards required in the zoning district, any applicable street setbacks, and easements.

c. Prohibit a shoreline setback "credit" for property owners who acquire, through land court and/or consolidation and resubdivision, accreted shorefront land.

Rationale:

The objective here is to prevent what has become a fairly common and ultimately destructive practice by beachfront property owners. In areas where there is substantial accretion occurring, an owner will acquire, by means of land court action or subdivision/consolidation or both, the accreted land. The shoreline and 40-foot shoreline setback area is then moved seaward onto the accreted land, giving the owner not only more total lot area but more buildable area beyond the original shoreline setback. Since erosion/accretion is a natural, inevitable cyclical process, eventually the accreted land erodes. The result is the placement of structures within the original setback area and the increase of negative impacts from these structures on natural beach processes. In these cases, not only is a public resource damaged, but the private structures are also endangered.

d. For new developments on vacant land, or redevelopments which result in a higher unit count (e.g., more than replacing one existing single-family residence), require a minimum setback of 60 feet; this increased setback would apply, for example, to Cluster Housing and Planned Development Housing.

Rationale:

This approach would provide an opportunity for avoiding some of the past negative impacts of residential developments and man-made interference with natural processes on remaining beaches. The application of increased setbacks to vacant land would not create nonconformities and, in those cases where development or redevelopment would result in increased residential densities, the trade-off, an

increased shoreline setback for increased density, should meet the test of substantially advancing the public interest. The opportunities for applying increased setbacks on vacant land are relatively limited in most beach sectors; however, the probability of redevelopment on large beachfront lots in the future is high. The potential impacts of increased densities on the adjacent beach resource make preservation strategies even more important than they have been in the past.

e. Create a mechanism for "grandfathering" illegal shoreline protection structures, if they meet specific, established technical engineering and design standards.

Rationale:

The existence of numerous seawalls constructed without permits, and without assessing impacts on adjacent properties, is a major concern in future beach preservation efforts. It is also a problem probably without a totally satisfactory solution from either the public or private viewpoint, but it is one which should be immediately addressed. Forced removal of existing illegal (41 percent) structures may present both legal and practical difficulties, especially in those areas where some form of structure is needed to protect private property. Granting after-the-fact permits is also an alternative, but not a particularly desirable one. If, on the other hand, the public interest can be met by the establishment of sound engineering and design standards for protective structures, and if the illegal structures meet or can be modified to meet these standards, then there would be some benefit in granting them nonconforming ("grandfathered") status. It should be noted that the restrictions on enlargement or replacement would still apply and, in the case of destruction, a new structure would have to conform to all current regulations. While this approach would not solve the problem and cannot undo the damage done, it would at least bring some element of administrative and engineering/design control to what has obviously become a large, uncontrolled problem.

f. Prohibit the use of vertical seawall structures in areas where this form of "protection" is not wide-spread and where future seawall requests are probable; require buried revetments, or allow some other, more benign, form of private property protection, without complex permit requirements.

Rationale:

The impact of vertical seawalls in the "hardening" of Oahu's beaches is well documented. At the present time, in addition to the high number of illegal seawalls, permit processes appear to encourage rather than

discourage this type of shoreline protection, even when it may prove ultimately destructive to the beach as a whole and when there may be better alternatives. In areas where the beach is relatively free of vertical seawalls, other means of erosion protection should be required instead. Finally, if the permitting processes are to work for long-term beach preservation (not inadvertently against), then some effort must be made to streamline approvals for the preferred type of protection structure as an incentive to private owners. In particular, small retaining walls, open work fences, or other types of benign structures to reduce the rate of erosion should be allowed without lengthy review or costly application requirements.

g. Strengthen criteria for granting shoreline setback variances, specifically by requiring stricter standards for proving "hardship."

Rationale:

The legal necessity of having some form of fair and equitable "relief" for property owners has previously been discussed and it is not suggested that variances not be allowed. However, it has also been noted that the availability of the variance procedure inherently weakens regulatory controls designed to preserve public beach resources. Relatively speaking, the standards for obtaining a zoning variance, e.g. showing that a "hardship" exists and therefore the applicant should be allowed to vary the zoning ordinance requirements, are stricter. (It should also be noted that these standards are traditional, found in most zoning ordinances and have withstood various tests.) Appropriate amendments should be made to ordinance and/or rules to incorporate this more stringent criteria for "hardship." Variances within the shoreline setback area should not be granted unless all criteria are met.

h. Apply established administrative enforcement procedures ("civil fines system") to violations within the shoreline setback area.

Rationale:

As noted elsewhere, a strong, consistent monitoring and enforcement effort is needed to carry through any selected beach preservation strategy. In Florida, for example, beach preservation programs and regulatory controls are monitored and enforced by both field inspectors and coastal engineers, and stiff fines are assessed for violations. Without a commitment to this aspect of beach preservation, government loses credibility in attempting to implement its strategies, and if the public perception is that enforcement is weak or nonexistent, then proliferation of illegal shoreline structures can be expected to con-

tinue. The administrative enforcement system is now widely applied to zoning, building, and Shoreline Management Area violations and procedures are well-tested. Further, application of the enforcement system to the Shoreline Setback Area has been authorized by State statute. The necessary ordinance and/or rule amendments should be made to establish the fine system for shoreline setback violations and the appropriate administration mechanism should be put into place.

Long-Term Strategies

a. Amend the Land Use Ordinance (Article 7.), or the Special Management Ordinance, to create a Beach Preservation District. Certain endangered beach sectors, those subject to chronic, long-term erosion or episodic and severe erosion, would be subject to this "overlay" type of regulation. Objectives would be established for each sector selected and specific regulatory requirements would be developed to deal with the problems common to that sector. These could include: the need for increased setbacks; special engineering and design features desirable for protective structures; prohibitions on certain types of structures or building practices; and non-regulatory strategies, such as beach replenishment or revetments.

Rationale:

The advantages of a district, overlay approach to beach preservation are discussed in detail in Section 6. of this report. To summarize, it would provide a site-specific means of controlling uses and development which might adversely affect beach preservation in the selected sector. It would provide a means of dealing with both short-term, immediate problems, and anticipated long-term impacts. Creating the Beach Preservation District regulation, the umbrella control itself, would be a relatively simple task. General intent and objectives are fairly straight-forward. Developing specific regulations for distinct and variable sectors within the District would likely require considerably more time, expertise, and consensus among the community directly affected. One major advantage is that the basic approach has been used before to preserve historic, scenic, and cultural public resources and that there is administrative experience in implementing this regulatory approach. It should also be noted, however, that the creation of a Beach Preservation District overlay would differ from other districts in that non-regulatory strategies would be needed to ensure that long-term objectives are met. These would include beach replenishment/renourishment, revetments when appropriate and other improvements requiring an investment of public or public/private monies. While either the Land Use Ordinance or the Spe-

cial Management Ordinance could be amended in this regard, the latter is considered the most appropriate vehicle for the overlay approach to properties within the Special Management Area. The focus of the amendment would be to include a review of all shorefront developments in selected beach sectors, including single-family dwellings.

b. Adapt the existing Improvement District approach to vulnerable beach sectors. This would require public/private "fair-share" cost assessments and a carefully-drawn consensus among those affected.

Rationale:

The potential of this approach, and its drawbacks, have been discussed elsewhere in this report. Without some form of funding, the non-regulatory, structural strategies which will be needed to preserve a beach sector cannot be realized. The difficulty in the Improvement District approach is determining the beaches which would benefit most from the approach, the fine line between public and private benefit, and the fair-share assessment for those private owners who indeed benefit most from the improvements. Overall, the strategy merits consideration, since it does represent a well-tested and traditional means of funding public improvements to shared resources.

c. Establish and fund a recruitment and training program for professional monitoring and enforcement staff to ensure that Shoreline Management objectives, in general, are being met, and that Shoreline Setback/Beach Preservation strategies are actually being implemented.

Rationale:

As has been noted previously, changes in State statutes and the conclusions of other studies indicate a trend toward asking the counties to assume monitoring and enforcement responsibilities for beach preservation and other coastal regulatory matters. This is considered logical and a progressive step in prioritizing State-wide concerns and in focusing in on the specific problem of resolving public resource/private ownership conflicts of Oahu's beaches. However, it has also been noted that monitoring and enforcement efforts have in the past fallen short of policy goals. More State funding should be earmarked specifically for finding and training personnel who can carry out the counties' responsibilities in this regard. The commitment must come from both levels of government and must be approached in a more vigorous and consistent effort than has been displayed in the past. There is no evidence to suggest that the lack of funding for policy plans, programs, or

even regulatory controls have contributed to the loss of a public resource in this instance. Rather, the most serious problem appears to be the lack of capability to follow through on stated consensual goals in a specific, realistic manner. Even if the regulatory regime were not to be changed (as recommended above), beach preservation goals could still be achieved to a large extent if existing regulations were effectively enforced. This will not happen without a properly trained professional staff or without funding support directed to this need.

8.2 Beach Sector Recommendations

WAILUA DISTRICT

8.2.A. Mokuleia

Shoreline protection structures in much of this area are not vertical rock walls, but are made of materials such as railroad ties and timbers, and function more like retaining walls than seawalls. The area also has many illegal seawalls and limited public access.

Mokuleia is an important, popular sandy beach providing opportunities for multiple recreational activities. It should be given high preservation priority.

Recommendations:

(a) Retain existing shoreline setback of 40 feet, but prohibit all future seawalls and require revetments instead;

(b) Prohibit shoreline setback "credit" on accreted land; and

(c) Provide periodic sand replenishment and revegetation.

8.2.B. Kawailoa

Papailoa and Laniakea Beaches

Some erosion is occurring in this area and there are many illegal seawalls. It is likely that these beaches will become future problem areas, e.g. similar to what has occurred at Ewa Beach, and it can be expected that there will be private property owner requests in the future for vertical walls as erosion continues.

Recommendations:

(a) Retain existing 40-foot shoreline setback, but allow seawalls only when an existing dwelling unit is endangered; and

(b) Give preference to revetments instead of seawalls, when the former is feasible.

Chun's Reef

This is an area where shoreline protection has been placed close to other structures along the beachfront. Illegal or nonconforming seawalls are the predominant protection structures in this area. The vegetation line is accreting at the present time, and there is a danger that the inappropriate use of accreted land will become a problem in the future.

Recommendations:

(a) Retain existing established 40-foot shoreline setbacks, except for new development on vacant land, or redevelopment which increases unit count, in which case, an increased setback of 60 feet should be required.

(b) Prohibit owners from "adding" accreted land to the shoreline setback area, either by land court action or subdivision/consolidation.

Kawailoa #1

Since the concerns for this beach sector are essentially the same as those for Laniakea Beach, the recommended future strategy is the same as well.

Recommendations:

(a) Retain existing 40-foot shoreline setback, but allow seawalls only when an existing dwelling unit is endangered; and

(b) Give preference to revetments where feasible.

KOOLAULOA DISTRICT

8.2.C. Sunset (Sunset Beach and Sunset Point)

These beaches are characterized by a number of scattered shoreline protection structures, many of which are illegal. Beaches are also subject to severe storms and cyclical wave damage.

Recommendations:

(a) Restrict the type of future shoreline protection, e.g. prohibit vertical seawalls; and

(b) Establish engineering and design standards for existing protection structures, so that illegal structures may be "grandfathered," provided they meet the standards.

8.2.D. Waialee

Kaunala Beach

This is an area where definite erosion is taking place and where new residential development has also occurred. It is likely that this will become a "problem" beach in the future.

Recommendations:

(a) Prohibit vertical seawalls as a form of shoreline protection in the future; and

(b) Require buried revetments, landward of the certified shoreline, with replanting of native vegetation.

Pahipahialua Beach

This is not considered a high-quality beach for active water sports, but has value in terms of view planes and open space, and is a potential problem area.

Recommendations:

(a) Retain existing 40-foot shoreline setback; and

(b) Allow revetments as the protective structure preferred whenever feasible.

8.2.E. Malaekahana

This is one of the largest stretches of sandy beach within the study area without shoreline protection structures. It is also an area where accretion and residential development may become serious future concerns.

Recommendations:

(a) Prohibit shoreline protection structures;

(b) Prohibit owners from crediting accreted land to the shoreline setback area; and

(c) Since no major nonconformities would be created, increase shoreline setbacks from 40 to 60 feet.

8.2.F. Laie Beach

This is an accreting beach where future subdivision and redevelopment under R-5 zoning is probable.

Recommendations:

(a) Maintain existing 40-foot shoreline setback area; and

(b) Prohibit owners from crediting accreted land to the shoreline setback area.

8.2.G. Laniloa Beach (Laniloa #1)

This is a fairly stable beach at the present time, but with numerous illegal seawalls. The proliferation of seawalls will eventually have a negative impact on what is now a relatively undisturbed sandy beach.

Recommendations:

(a) Maintain existing 40-foot shoreline setback area, but require removal of all illegal seawalls and prohibit seawalls in the future; and

(b) Require revetments, rather than seawalls, if some form of shoreline protection is adequately justified.

8.2.H. Kokololio Beach (Kokololio #1)

This is characterized as a stable, but accreting beach where future subdivision and residential development is likely.

Recommendations:

(a) Maintain existing 40-foot shoreline setback area; but

(b) Prohibit seawalls as a means of shoreline protection.

KOOLAUPOKO DISTRICT

8.2.I. Kailua Beach

As noted previously, this is a high-quality, popular beach which is subjected to cyclical erosion and accretion. There are numerous illegal and nonconforming seawalls in the area and no revetments. This is a dynamic beach area, with major sand movement, and should be given high priority in preservation strategies.

Recommendations:

(a) Retain existing 40-foot setback for existing developed lots, and those lots redeveloped at current density; but

(b) Prohibit shoreline setback credit for accreted land; and

(c) Require increased setbacks (60 feet) for new developments and redevelopment which increases residential density (this area can be expected to be redeveloped in the future, because of large lots and residential zoning).

HONOLULU DISTRICT

8.2.J. Portlock

This is an area where little can be done to restore the beach, because of past actions. It is also an example of the proliferation of shore protection structures in response to on-going erosion.

Recommendations:

(a) Maintain existing 40-foot shoreline setback area, but monitor building permits for the rebuilding of existing seawalls; and

(b) Ensure that all future shoreline protection structures meet uniform and sound engineering and design criteria.

8.2.K. Kahala

This is a popular sandy beach where both erosion and accretion has occurred. Further erosion is likely, because of seawalls built to the west. The beach is stable now, and heavily used. Some redevelopment, perhaps at higher residential densities, is also possible. The proliferation of individual seawalls will likely result in future beach loss.

Recommendations:

(a) Prohibit vertical seawalls and require buried revetments;

(b) Require increased setbacks (60 feet) for new developments on vacant land or redevelopment which would increase density; and

(c) Prohibit shoreline setback credit for accreted land.

WAIANAE DISTRICT

8.2.L. Maili Beach

This is a beach subject to accretion, and the inappropriate use of accreted land should be prohibited.

Recommendations:

(a) Maintain existing 40-foot shoreline setback area, but prohibit shoreline setback credit for accreted land.

8.2.M. Mauna Lahilahi Beach

While this is not a relatively high-quality beach, its monitoring is important in terms of preserving adjacent existing and planned public beach parks. Inappropriate shoreline protection structures could have negative effects at both ends of the beach sector.

(a) Maintain existing 40-foot shoreline setback area; but

(b) Give priority to the preservation of lateral access in the review of any shoreline structures, especially seawalls; and

(c) Give preference to revetments when feasible.

8.2.N. Makaha Beach

There are numerous illegal seawalls and other shoreline structures at the south end of this beach and it is a prime example of how vertical seawalls adversely affect beach processes. Its value as a surfing site justifies a high priority for preservation.

Recommendations:

(a) Maintain existing 40-foot shoreline setback, but prohibit any future shoreline protection structures, unless they are placed on top of or behind the seasonally exposed limestone bench or ledge.

TABLE 2.
SUMMARY OF BEACH SECTORS AND RECOMMENDED PRESERVATION STRATEGIES

Sector	Backshore	Zoning	Access	Conditions & Strategy
Mokuleia	Open Houses Apts. Park	R-7.5 R-5 AG-2 P-2	Good	High quality, priority beach; no "credit" for accreted land; replenish and revegetate.
Papailoa & Laniakea	Houses	R-5	Good	Erosion, future problem area; seawalls only if dwelling endangered.
Chun's Reef	Houses	R-5	Good	Vegetation line accreting; 60-foot setback for new development; no credit for accretion.
Kawailoa #1	Houses	R-5	Good	See Laniakea above.
Sunset Beach	Houses Highway Parks	R-5 P-2	Good	Severe storm & wave damage; prohibit vertical seawalls; "grandfather" some structures
Sunset Point	Houses	R-5	Poor	Same as Sunset Beach.
Kaunala Beach	Open Houses	R-5	Good	Erosion, future problem area; prohibit vertical seawalls; require revetments & replanting.
Pahipahialua	Open Houses	R-5	Good	Potential problem area, but not as high quality as others; allow revetments when feasible.
Malaekahana	Houses Park	R-5 P-2	Good	High quality, future problem area; prohibit shoreline protection & accreted land credit; require 60-foot setback
Laie Beach	Park Houses	P-2 R-5	Good	Accreting beach; prohibit credit for accreted lands.
Laniloa #1	Houses	R-5	Good	Relatively undisturbed; prohibit seawalls & remove illegal structures
Kokololio #1	Open Houses	P-2 R-5	Good	Accreting beach; prohibit seawalls.
Kailua Beach	Houses Park	R-10 P-2	Good	High quality, dynamic; prohibit credit for accreted land; 60-foot setbacks for new units.
Portlock	Houses	R-10	Marginal	Largely lost; monitor rebuilding of seawalls & establish new design criteria.
Kahala	Houses	R-5 R-7.5	Good	Future erosion likely; prohibit vertical seawalls; 60-foot setbacks for new developments.
Maile Beach	Houses Apts. Park	R-5 A-2 P-2	Good	Subject to accretion; prohibit credit for accreted lands.
Mauna Lahilahi	Park Houses	P-2 R-10	Good	Important due to public beach parks; give priority to lateral access.
Makaha Beach	Apt. Houses	A-2 R-10	Good	Priority site; prohibit future structures unless properly placed.

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